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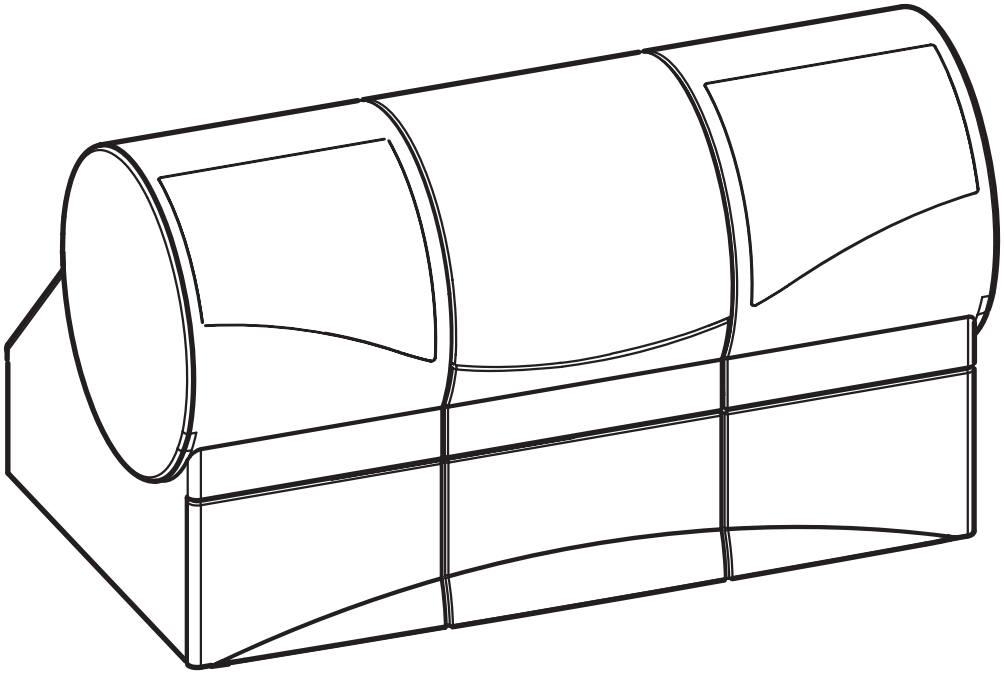
sirona
The Dental Company

CEREC / inLab MC XL

Service Manual

English



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General information

CEREC / inLab MC XL

1 General information

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1.1 General information

Nominal line voltage ranges

The CEREC MC XL / inLab MC XL milling unit can be operated in the following

- nominal line voltage ranges: 100 - 230VAC; 50 / 60 Hz

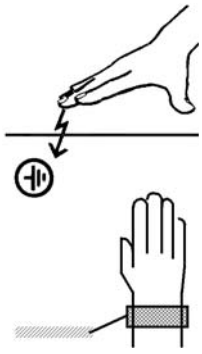
Wireless phone interference with medical electrical equipment:

NOTE:
To ensure safe operation of medical electrical equipment, the use of mobile wireless phones in practice or hospital environments is prohibited.

ESD warning label

CAUTION:
Connector pins or sockets bearing ESD warning labels must not be touched or interconnected without ESD protective measures.

ESD protective measures



ESD protective measures include:

- Procedures for preventing electrostatic charge build-up (e.g. air conditioning, air moistening, conductive floor coverings and non-synthetic clothing)
- Discharging the electrostatic charges of your own body on the frame of the unit, the protective ground wire or large metallic objects
- Connecting yourself to ground using a wrist band.

Measurements

Always switch off the unit before connecting the measuring instrument.

Select the correct current/voltage type and adjust the measuring range to match the expected readings.

Perform continuity tests only on units which are switched off.

When replacing parts

WARNING: Potentially lethal shock hazard when working near the power supply unit
Disconnect from the line power supply.
Check for zero potential.

Switch the unit **off** and disconnect the power plug before replacing parts.

The article numbers for ordering spare parts can be found in the spare parts list, Order No. 61 45 853.

The diagrams contained in the spare parts list provide a useful guide when replacing parts.

Before replacing the boards, observe the ESD protective measures.

Disposal

Observe the information on disposal in the relevant operating instructions.

Installation site

Observe the information on the installation site in the relevant operating instructions.

1.2 Additional information

In addition, you also require:

CEREC / inLab MC XL spare parts list

Order No.: „61 45 853“

CEREC / inLab MC XL wiring diagrams

Order No.: „61 39 278“

CEREC / inLab MC XL Operating Instructions

CEREC MC XL, Order No.: "61 46 885"

inLab MC XL, Order No.: "61 39 237"

Documents:

Operating the MC XL via LAN (61 90 503)

Operating MC XL via WLAN in the Ad-hoc mode (61 90 545)

Operating MC XL via WLAN in infrastructure mode, Restoring default settings (61 90 560)

Tools

- Allen key angled, size (mm) 1.27 (0.05”); 1.3;6
- Open-end wrench, size (mm) 6;10
- TORX screwdriver, size 6; 8; 10; 20
- Phillips screwdriver, size 1
- Blade screwdriver, insulated, sizes 2 and 3
- Box wrench: 6 mm; 7 mm
- Universal pliers
- Flat pliers
- Torque wrench, 1.1 Nm
- Feeler gauge 0.1 mm

Auxiliary tools & equipment

- Digital Multimeter, Accuracy Class 1
- Soldering tool for repairing cables
- Diagonal-nosed cutting pliers
- Cable ties
- Teflon tape
- Loctite 221
- Calibration set (supplied with unit)
- Step Bur 12 and Step Bur 20
- Torque wrench for changing the milling instruments (order no: 61 19 346)
- Fuses (recommended):

F1 (2 pcs)	T5H250V	Order No.: 20 33 111

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Description of the service software

CEREC / inLab MC XL

2 Description of the service software

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2.1 General information

Test requirements

Requirement for all tests:

- PC / acquisition unit is switched on and ready for operation.
- PC / acquisition unit and milling unit are interconnected (via network cable or WLAN)
- The door of the milling chamber must remain closed as long as any motors or the water pump are running. If the door of the milling chamber is opened during the test, all motors and the water pump will switch off immediately (same function as pressing the "STOP" button).
- The tools (burrs) must be installed already during operation of the water pump.
- During operation of the water pump, the air pump **must**always be running to protect the DC motors against water damage, i.e. the air pump is started first. If the air pressure switch detects no air pressure, an error message will appear and the test cannot be performed.

Service software log file

The Service software generates a log file for all tests performed. This log file is located in the folder on delivery.

c:\programme\Cerec\System\Service\Protocols and is named **Testdatei_XXXXXXXXXXX.TXT**

The Xs here denote the serial no. of the milling unit.

Each time the service software is started, a confirmation query appears asking whether this file (if it already exists) should be deleted. If "No" (do not delete) is selected, the tests subsequently performed will be appended to the ones previously saved. Each test is labeled with a starting and ending date. The test file can be viewed with the editor at any time. If the user quits a test without saving it, he will be asked if he really wants to quit without saving. If "Yes" (Quit without saving) is then selected, the data just measured will be lost.

Assessment scores

There are three different scores which can be assigned to test results:

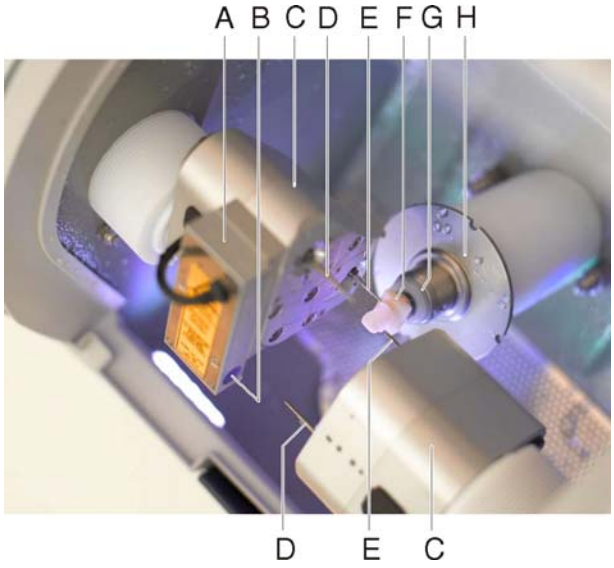
- passed fully ("Passed fully", (green label)
- passed ("Passed", yellow label)
- not passed ("Not passed", red label)

The area which passed may be irrelevant for a specific test. In that case, n.a. (not applicable) will be written to the log file for this area.

NOTE: Assessment scores
Passed fully: If all test results are scored "Passed fully", flawless operation of the system is possible.
Passed: If the test results are scored"Passed", uncritical changes have occurred.
Not passed: If the test results are scored "Not passed", you must find and eliminate the cause.

CAUTION: Keep the cover closed
If the milling unit housing is left open, the temperature switch on the controller board may cut out after a short time (T>90°C). The cooling fan can work properly only with the cover closed.

Milling chamber



Milling chamber

A	Scanner	E	Bur Set 2
B	Scanner window	F	Ceramic block
C	Motor mount	G	Workpiece spindle
D	Bur Set 1	H	Block clamping nut D6/D10

NOTE: Availability of the test options
Some tests (e.g. motor set 2) are selectable only with inLab MC XL or with CEREC MC XL with a second bur set (optional).

2.2 Basic structure of test dialogs

NOTE: Damage to system
The Service functions may be used only by authorized service engineers who have been trained by Sirona.

Password

The service software test dialogs are protected by a password to prevent manipulations by unauthorized users.

The password has four digits. It changes daily and is generated from the system date of the computer according to the following scheme:

Password number	Generated from
1	2. number of the current month

Password number	Generated from
2	1. number of the current month
3	2. number of the current day
4	1. number of the current day

Example: 02/28/2007 becomes 2082

CAUTION: Do not disclose the password scheme
Do not disclose the password creation scheme to others.
Before entering the password, always determine the date as inconspicuously as possible.
Since the password is always valid for one single day only, it can be passed on to the user in exceptional cases, e.g. to provide immediate telephone support.

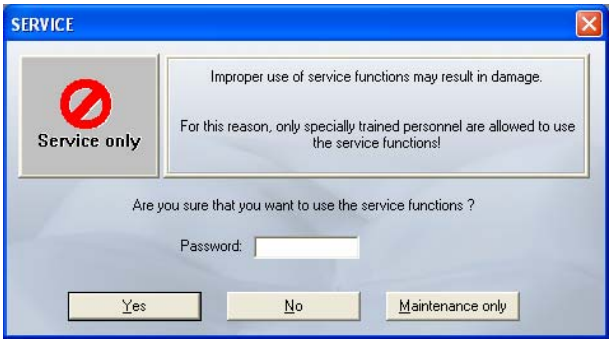
NOTE: Password input errors
If the commands are not enabled after you enter the password, check the following:
- correct entry of the password,
- the system date set on the computer.

The dialog for setting the system time can be called up in all Windows operating systems by double-clicking the time displayed in the systray.

Opening the Service software

1. Open the Service menu as follows.
   CEREC MC XL:
   `"Start"/"Programs"/"CEREC"/"Service"`
   inLab MC XL:
   `"Start"/"Programs"/"inLab"/"Service"`

   ↳ The Service Login dialog box then opens for password entry.


SERVICE
Service only
Improper use of service functions may result in damage.
For this reason, only specially trained personnel are allowed to use the service functions!
Are you sure that you want to use the service functions ?
Password:
Yes
No
Maintenance only

2. Enter the password and confirm your entry with the `"Yes"` button.

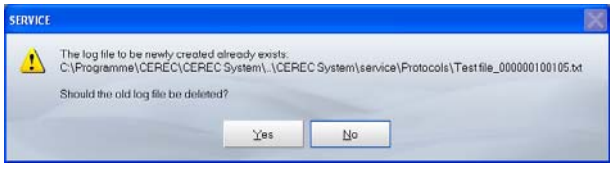
NOTE: Select the milling unit

If there is no data link between the milling unit and the acquisition unit / PC or several milling units are connected, the "Select milling unit" dialog box will open.

- ➢ Establish a data link if necessary.
- ➢ Click the "Add automatically" button.
- ↳ The acquisition unit / PC installs the milling unit.
- ➢ Select the relevant milling unit and confirm your choice with the "OK" button.

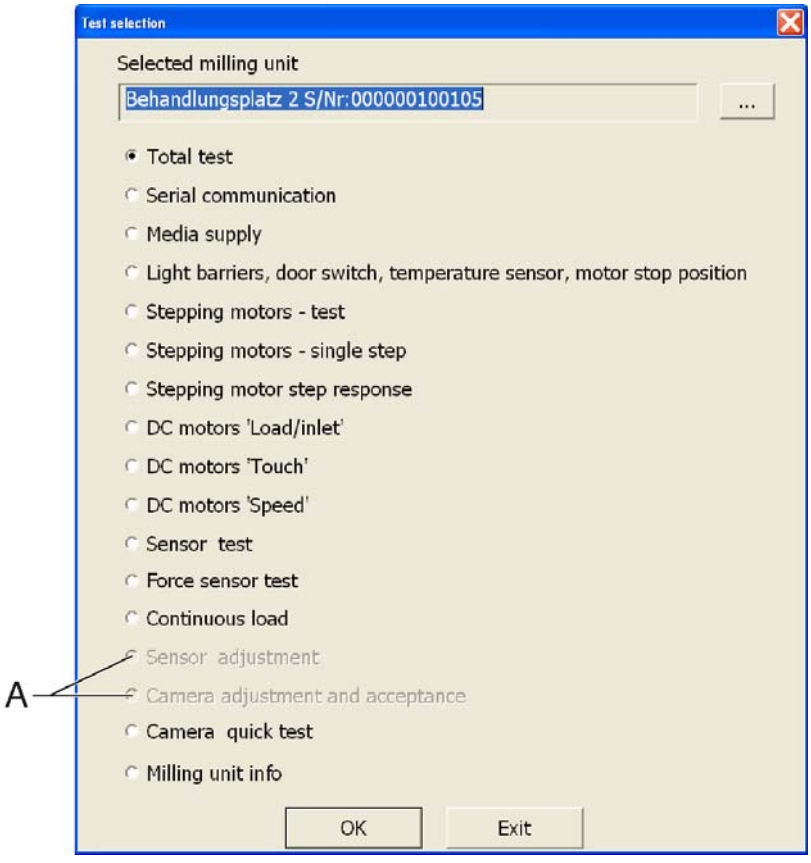
Log file

If a log file with the name of the milling unit you have selected already exists, you will be asked if you want to delete this file.



- Click the "Yes" button:
  The old file is then deleted and a new log file is created.
- Click the "No" button:
  The old file is then not deleted and the data from the new test run is appended to it.

Test selection dialog box



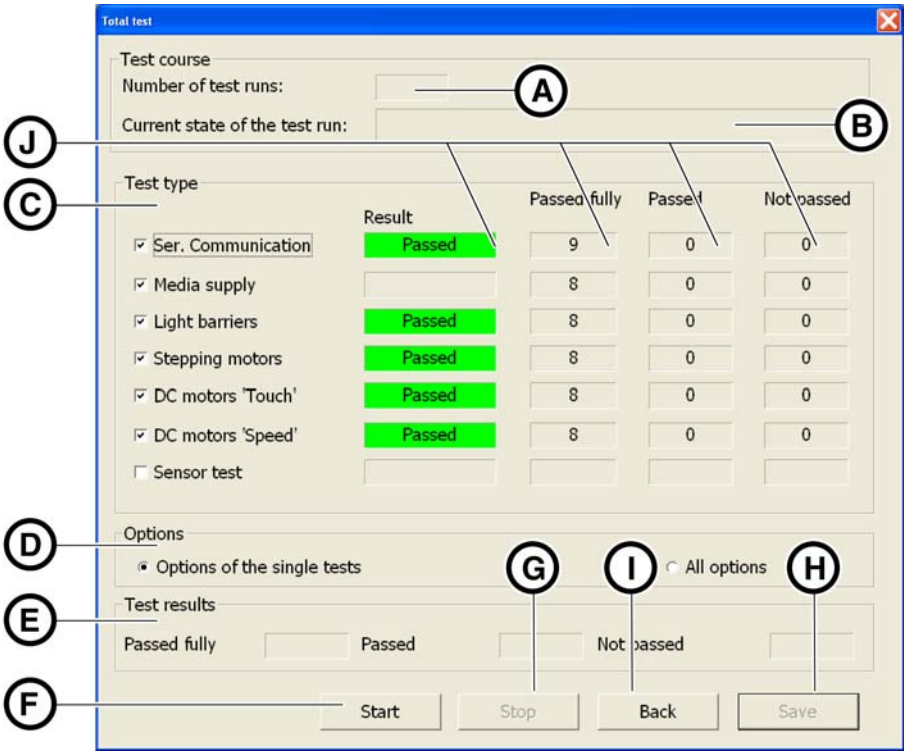
A Tests performed only at the factory

In the "`Test selection`"dialog box you can select

- a test for the complete milling unit ("`Total test`") or
- an individual test.

The selected test dialog box then opens if you click "`OK`".

Example: Total test



Total test

A	Number of test runs completed since the last time the Start button was actuated.
B	Progress bar for test currently being run.
C	Check boxes for selecting (activating/deactivating) the tests available in this test dialog.
D	Check box for selecting the options possible in this test dialog.
E	Number of test results since the last start: ▪ Passed fully ▪ Passed ▪ Not passed
F	Pressing the "Start" button starts the test run with the selected settings. The test run is repeated until it is cancelled by pressing the "Stop" button. The test run counter is then reset to 0. Once started, the test run can be halted only with "Stop". No other inputs are possible during the test run.
G	The test is canceled as soon as possible with the "Stop" button. The test in progress at the time of cancellation is not counted. All inputs are now possible again.

H	All existing data can be saved to the log file by pressing the "Save" button. The data are appended to the previously existing log file (if the current test run has not yet been saved). If no data exist, a message to that effect will appear (confirm with "OK"). Once a test run has been saved to the log file, a new test run must be started before selecting the save function again.
I	Press "Back" to quit the test dialog and return to the service dialog. If any data exist and have not yet been saved, you will be asked whether or not the test data should be saved.
J	Result: ▪ No color: No measurement available yet. ▪ green: Test passed fully. ▪ yellow: Test passed. ▪ red: Test not passed.

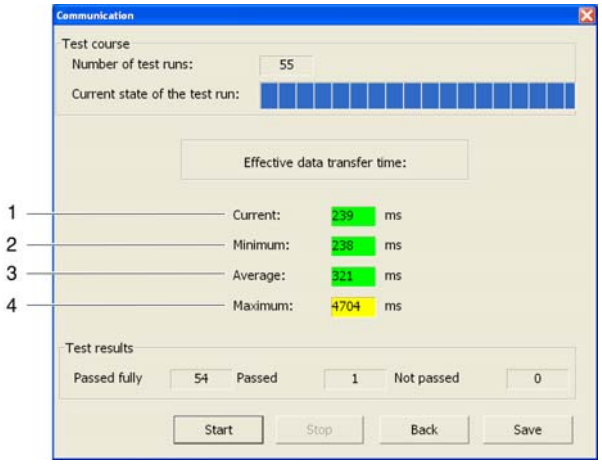
2.3 Individual Test Points

2.3.1 Serial Communication

The test is primarily used to measure the speed and quality of data transmission. This is especially important if the system is not operated via the network cable (LAN) but rather via other types of connections such as e.g. WLAN (AdHoc, Infrastructure.

The transmission time between the beginning of transmission and the end of reception is calculated for a specific record on the PC. A test run comprises one complete transmission in both directions.

The values thus measured are then saved to the log file.



Serial Communication

1	Result of last test run	3	Average measured transmission time
2	Minimum measured transmission time	4	Maximum measured transmission time

Typical values

	Time
LAN	200 - 400 ms
WLAN	300 - 600 ms

2.3.2 Media supply

Purpose of Test:

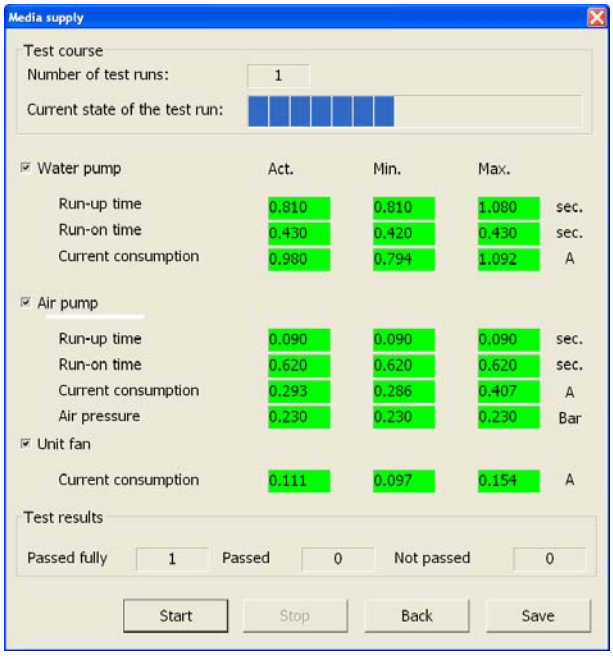
To check the media supply (air, water, fan) for proper functioning and test the pressure switches and the function of the pump.

Procedure

The pumps and the fan are switched on by nominal select control depending on selection. The motor currents and the condition of the pressure switches are registered. The points of time when the pressure detectors respond are measured. After approx. **5 sec** the pumps are switched off and the time required until the pressure switch responds is measured and evaluated.

Save

Save stores the measured values to the log file under the heading of Media supply.



Media supply

Deviations of measurements

Deviations may occur:

- During the first test run (if any air is still in the water circuit)
- If the amount of water in the water tank is insufficient
- After filling the water tank.

2.3.3 Light Barriers, Door Switch, Temperature Sensor and Motor Stop Positions

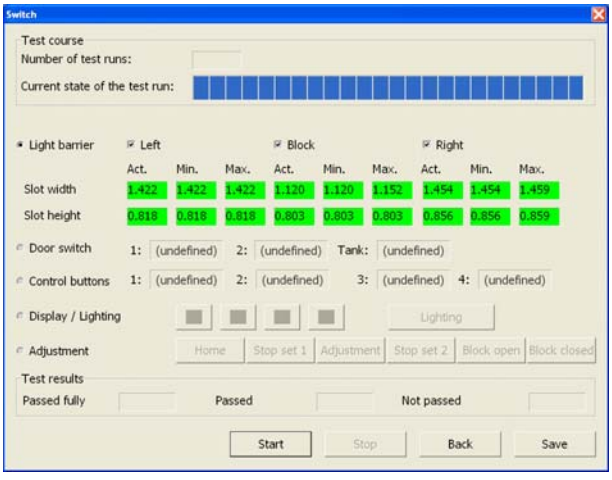
Purpose of Test:

This test serves to evaluate the safe functioning of the light barriers and check the door switch, the temperature sensor and the motor stop positions.

Light barrier

When the end position is located, the slot of the gear is measured via the width and height at which the stepping motor positions are registered with the flanks.

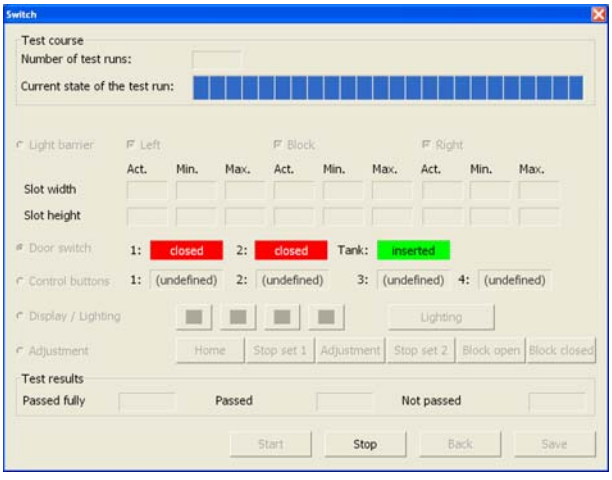
The light barriers to be tested can be selected in all variations. If no light barrier is selected, the Start button is not active. Default setting: All light barriers selected.



Switch - light barrier

Door switch/Tank switch

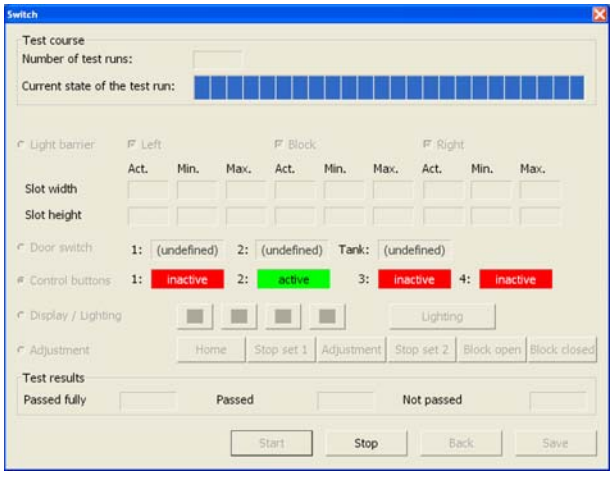
The current state of the door switch and tank switch can be checked via a status bar display.



Switches - Door and tank switch

Control keys

The current state of the control keys can be checked via a status bar display.



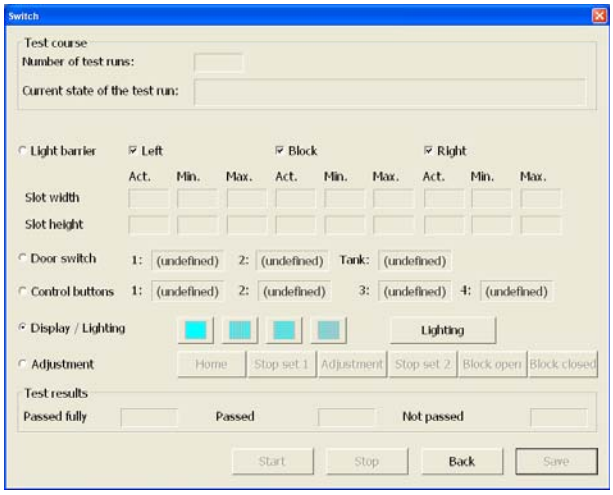
Switches - Control keys

Display / Illumination

The selected pattern is shown on the display as a display test.

The "Illumination" button tests all colors of the milling chamber illumination:

- white (milling, default color)
- blue (scanning)
- green (operation completed)
- red (error / Stop button pressed)

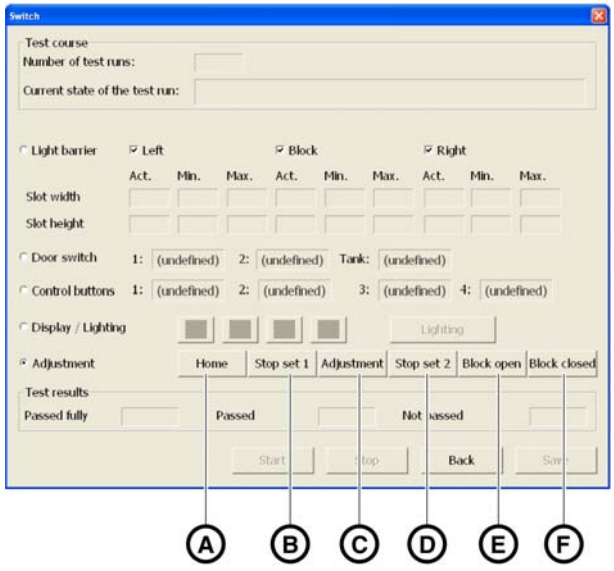


Switches - Display / Illumination

Adjustment

⚠ATTENTION: Open block / Close block
Place a block in the block axle to test the Open block / Close block function.

The motors are moved to these positions to test the motor stop positions. Depending on which button is selected, the motors move to the corresponding position and stop there. The motors can be reset to their home positions by pressing the "Home" button.



Switches - Adjustment

A	Home position	D	Stop position for tool change (set 2)
B	Stop position for tool change (set 1)	E	Open block
C	Aux. position for replacing components	F	Close block

2.3.4 Stepping motor test

Purpose of Test:

This test serves to evaluate the functioning of the stepping motors. The stepping motors are tested and evaluated for this purpose. In addition, this test can also be used to break in the milling machine.

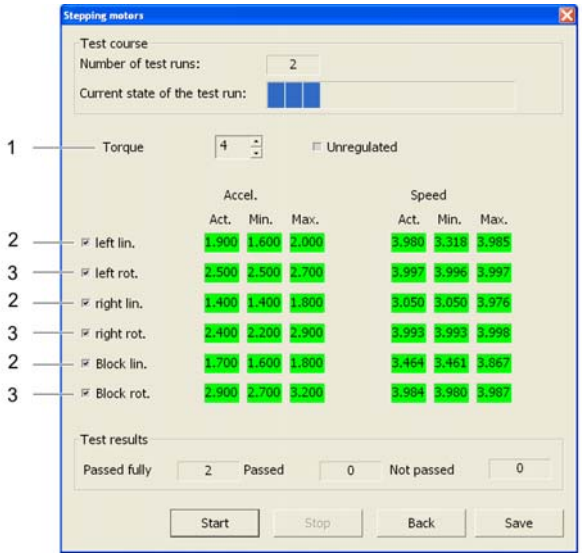
⚠ATTENTION: Blocks in the block axle!
Remove any blocks possibly present from the block axle.

Procedure

It is possible to individually trigger and test the stepping motors in various combinations. The stepping motors are run at various speed settings and evaluated via an acceleration table.

Display of test results

In order to satisfy different requirements for adjustment and testing purposes, this test also offers the option of choosing between data summation and display of the results for individual test runs.



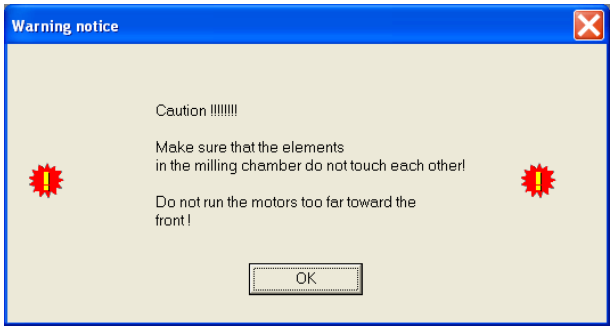
Stepping motor test

1 Activation of the stepping motors at a variously adjustable torque (recommended setting: 4).

2 Longit. movement (linear)

3 Rotary movement (rotation)

2.3.5 Stepping motors - Single step

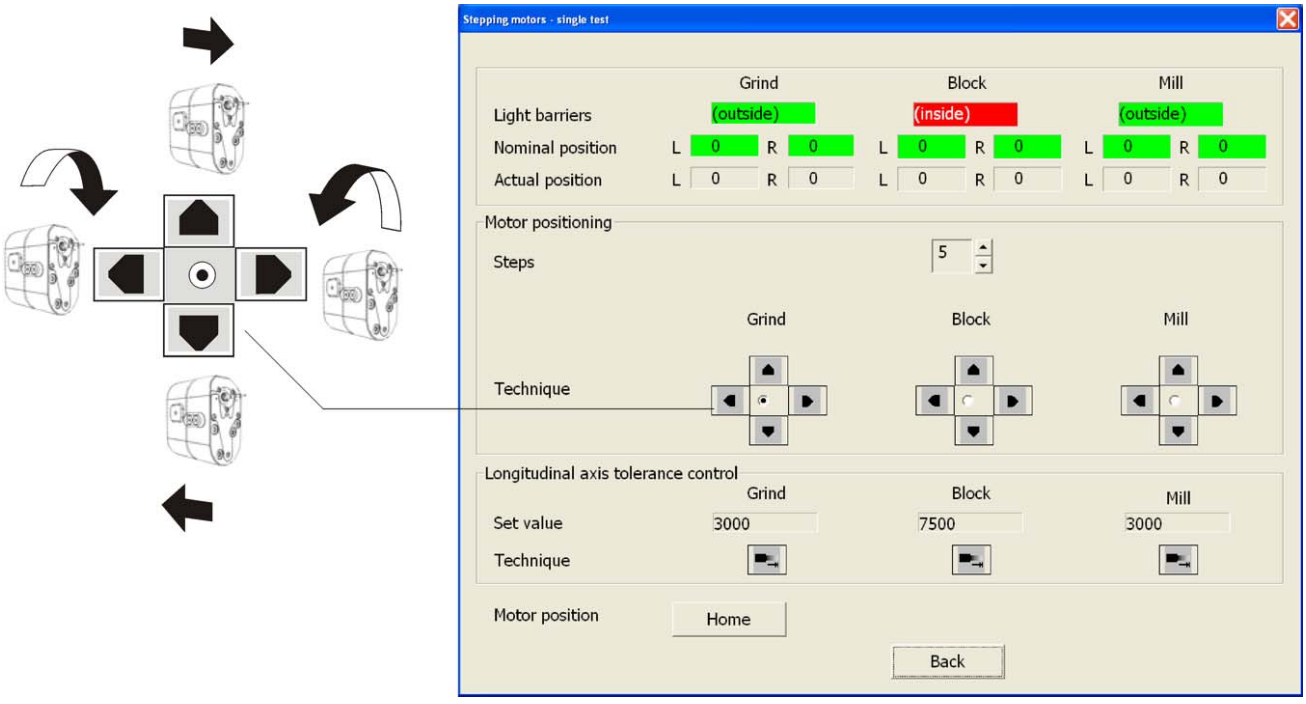

Warning notice
Caution !!!!!!!
Make sure that the elements
in the milling chamber do not touch each other!
Do not run the motors too far toward the
front !
OK

Warning on stepping motor test

NOTE:
Observe the warnings in the opened dialog.

Purpose of Test: The test is used to control the motors individually in case of malfunction.

Procedure Using the "`Technique`" buttons, you can move the individual motors in the longitudinal and rotary directions.



Grind	= left
Mill	= right

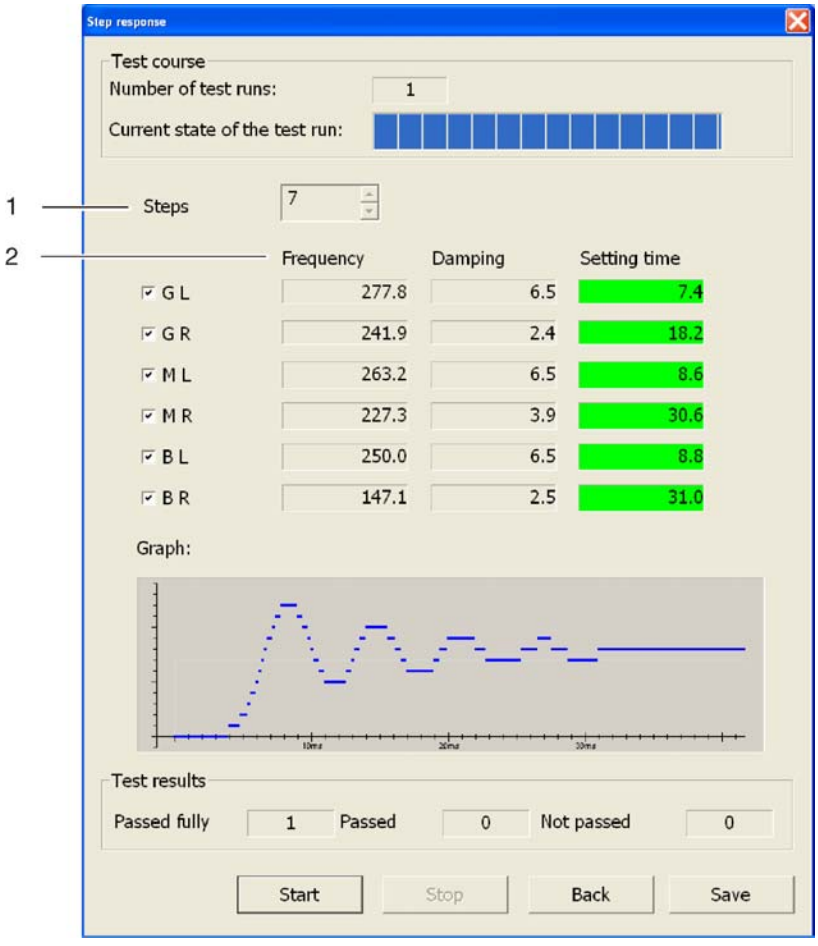
Under the option "Longitudinal axis tolerance control"the "Grind", "Block" and "Mill" axles can be extended by a permanently set value. This specific feed supports servicing e.g. when replacing a DC motor or cleaning the block chuck. It is activated by **double-clicking** the corresponding activation button .

	Left (Grind)	Block	Right (Mill)
One longit. step (L) equals	6,25 µm	6,25 µm	6,25 µm
One rotational step (R) equals	approx. 0.01° (0.6')	approx. 0.06° (3.6')	approx. 0.01° (0.6')

2.3.6 Stepping motor - Step response

Purpose of Test:

This test serves to detect the damping behavior of the stepping motors.



Stepping motor - Step response

1 Height of step (-7 to +7).
Recommended setting: +7

2 Response time of damping behavior in [ms]

Procedure

A test cycle is run following each start.

If no motor is selected, the "START" button is not active.

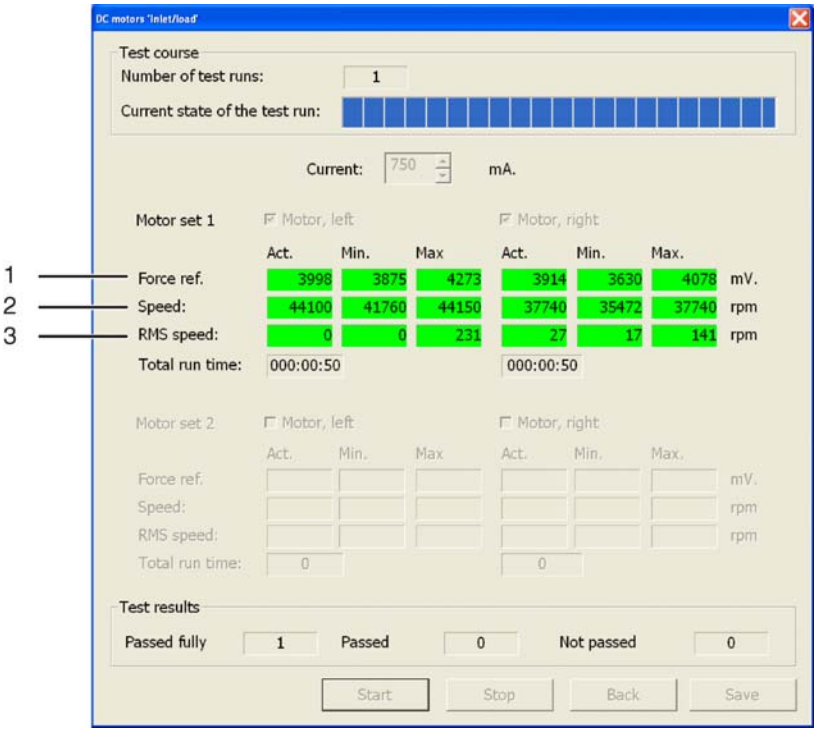
2.3.7 DC motors 'Load/inlet'

Purpose of Test:

This test serves to run in the DC motors and check them for proper functioning under continuous load.

Procedure

The DC motors are tested through operation at a constant current. The resulting speed provides an indication of the running resistance of the motor.



Stepping motors 'Load/Run-in'

1	Force reference value	3	Measure of speed fluctuations
2	Actual speed		

The two motors (left motor, right motor) can be selected together or separately. The speed range of the DC motor can be tested selectively via the adjustable motor current. If no motor is selected, the START button is not active. Default: Both motors selected.

Test run:

The test runs in an endless loop until the "Stop" button is actuated. The current measured values are displayed. A test run consists of one part "run time" and one part "pause" for each motor.

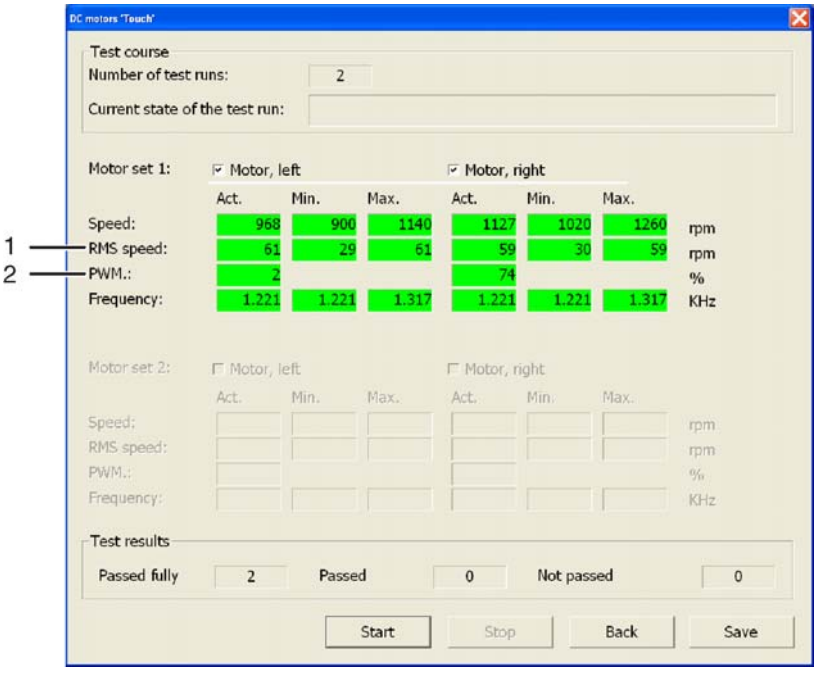
2.3.8 DC motors 'Touch'

Purpose of Test:

This test is used to check the two DC motors for proper functioning in the Low-speed mode.

Procedure

The DC motors are tested by adjusting them to the touch speed (in the relevant directions of rotation). Then the relevant data are determined.



DC motors 'Touch'

1 Measure of speed fluctuation

2 Pulse-width modulation

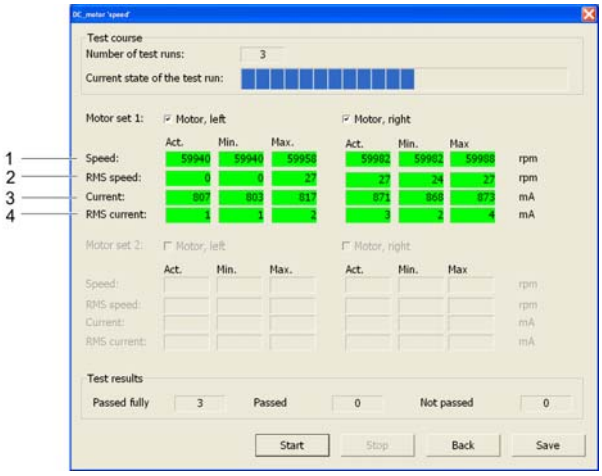
The possible motors can be selected either together or separately.

If no motor is selected, the "`Start`" button is not active. Default: Both motors selected.

2.3.9 DC motors 'Speed'

Purpose of Test:

This test is used to check the two DC motors for proper functioning in the High-speed mode.



DC motors 'Speed'

1. Measured speed
2. Fluctuation of speed
3. Measured motor current
4. Fluctuation of motor current

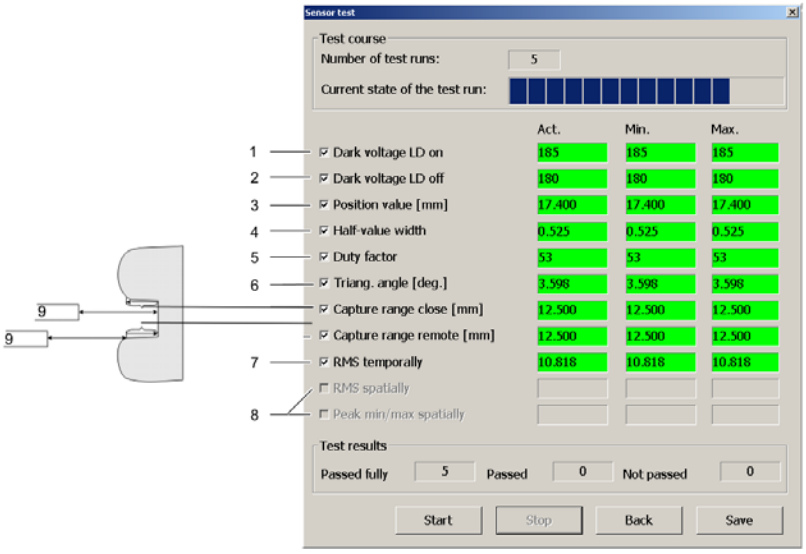
Procedure

The DC motors are tested by accelerating them from a standing start to operating speed and then measuring the relevant data, e.g. speed and current.

2.3.10 Sensor test

Purpose of Test:

This test serves to evaluate the functioning and accuracy of the scanner.



Sensor test

1	Laser active signal level	6	Measuring angle
2	Laser inactive signal level	7	Dimension of noise level
3	Distance between scanner and measuring point	8	This test is deactivated in the factory setting
4	Focal size	9	Scanner
5	Selection of laser diode		

Procedure

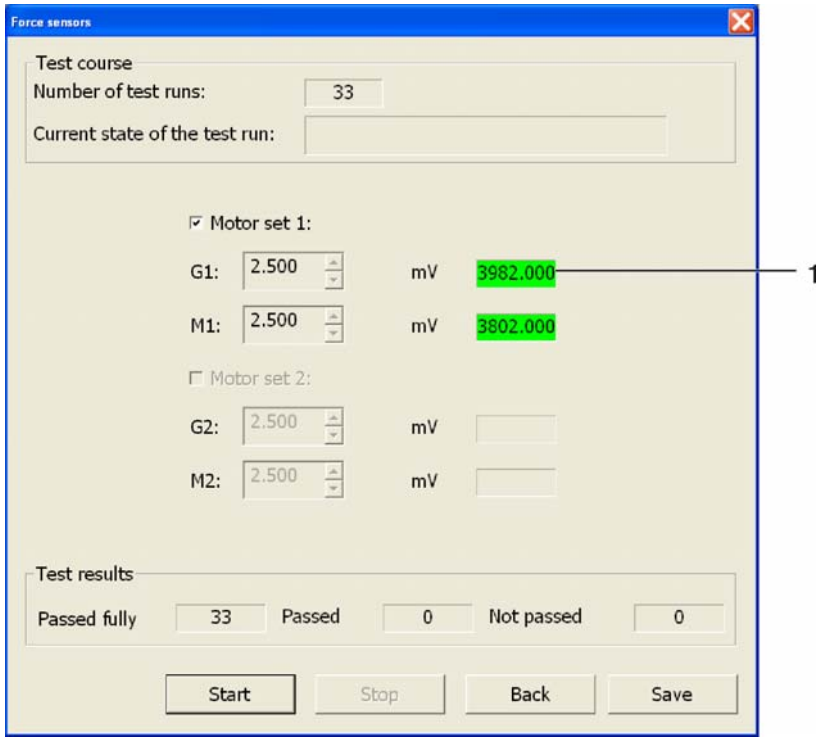
The various required measurements are performed with the help of the calibration phantom.

The functions to be tested can be selected in different variations. If no function is selected, the "`Start`" button is not active. Default setting: Test all functions.

2.3.11 Force sensor test

Purpose of Test:

This test serves to check the static functioning of the force sensor.



Force sensors

1 Voltage measured by the measuring bridge

Procedure

A voltage is applied to test the force sensor. The the voltage returned by the measuring bridge is measured.

The motors can be selected either together or separately.

ATTENTION: Motors
The motors must be freestanding before you perform this test. Move to the home position for this purpose.

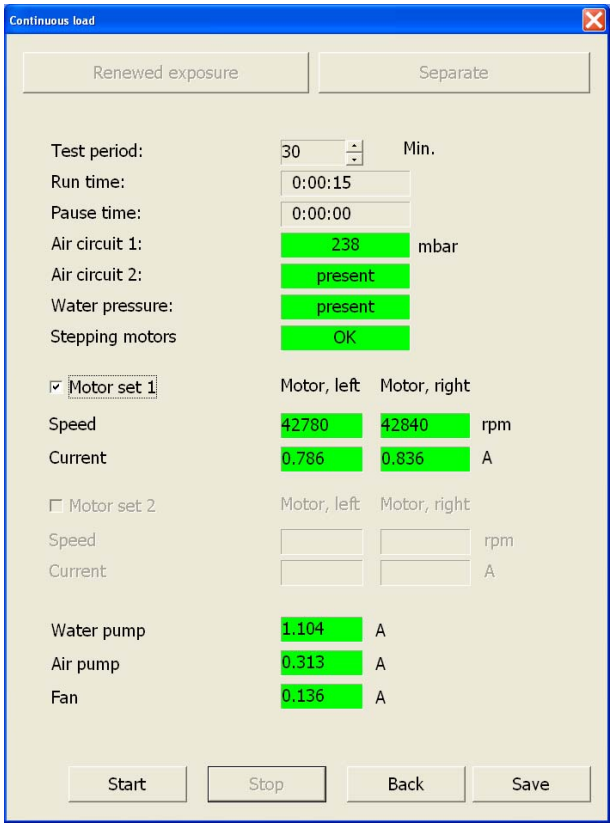
If no motor is selected, the "START" button is not active.

2.3.12 Continuous load

Purpose of Test:

This test serves to simulate a maximum load for the power supply and intentionally heat up the entire system.

All loads can be operated simultaneously.

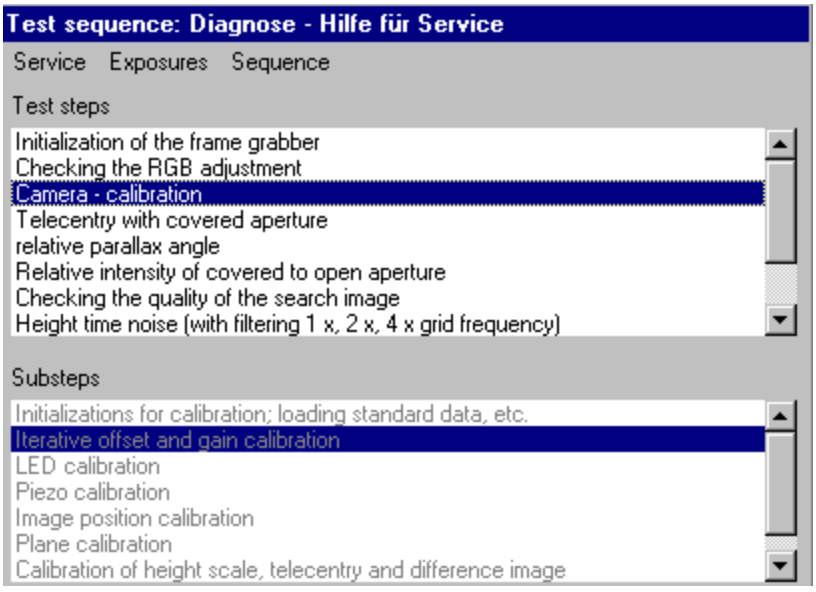


Continuous load

2.3.13 Camera quick test

The camera quick test consists of a series of individual test steps, which can be carried out both in the specified order and individually.

NOTE: Experienced service engineers
Some test steps are made up of several partial steps, some of which can be activated individually. These functions should only be used by trained technicians.


Test sequence: Diagnose - Hilfe für Service
Service
Exposures
Sequence
Test steps
Initialization of the frame grabber
Checking the RGB adjustment
Camera - calibration
Telecentry with covered aperture
relative parallax angle
Relative intensity of covered to open aperture
Checking the quality of the search image
Height time noise (with filtering 1 x, 2 x, 4 x grid frequency)
Substeps
Initializations for calibration; loading standard data, etc.
Iterative offset and gain calibration
LED calibration
Piezo calibration
Image position calibration
Plane calibration
Calibration of height scale, telecentry and difference image

Test run: Diagnosis

Operate by clicking the buttons in the bottom right part of the screen.

Operation

When carrying out the test steps in the specified order, which is not recommended, only the "next" button need be used.

NOTE:
In many cases, clicking "next" is the same as pressing "Return".

To select individual test steps, either select the test step (by clicking it with the left trackball button, so that it is highlighted in blue) and then press "jump" or double click the test step. Test steps can also be selected by choosing "Next", "previous" or"repeat".

Select "Stop" to stop the process. After you click "Stop", the button remains highlighted until the sequence has actually stopped. "Stop"then returns to its normal shading and the sequence can be continued by selecting the corresponding buttons.

Select "Exit"to exit the test run.

If the test run is terminated without executingthe test step

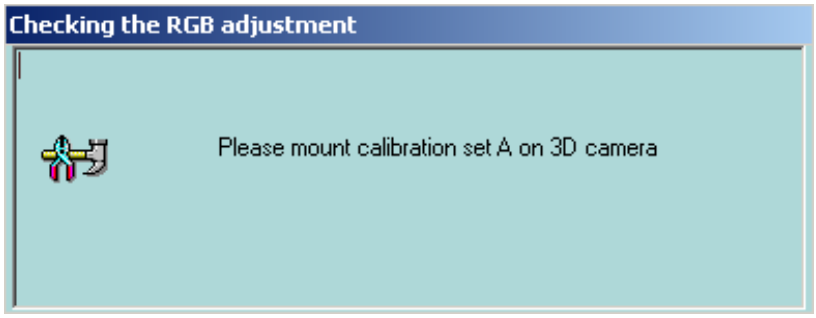
- "Closing the frame grabber" or
- "Service"/"Protocol"/"save",

no protocol (log file) is saved.

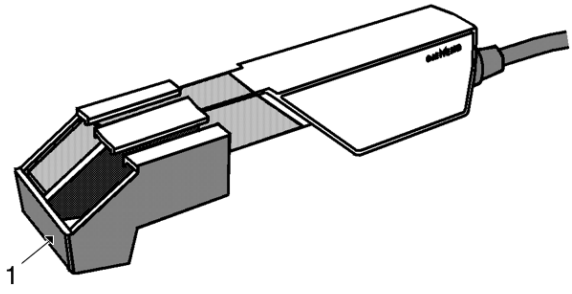
If a blue dialog box appears, you must select "next"to continue the sequence after following the instructions contained in the box.

Calibration Set A

If Box **A** appears, please set Calibration Set **A** to the 3D camera.



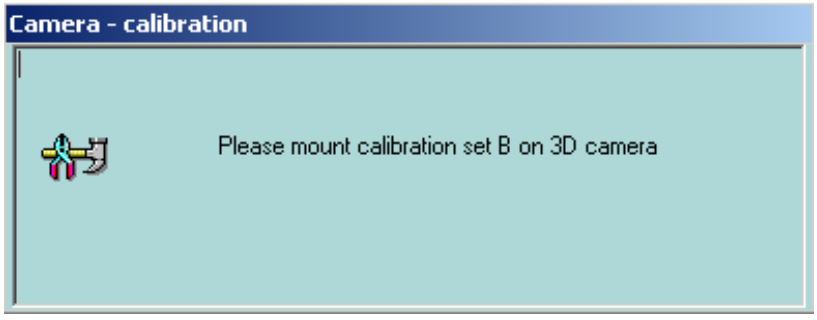
Checking the RGB adjustment



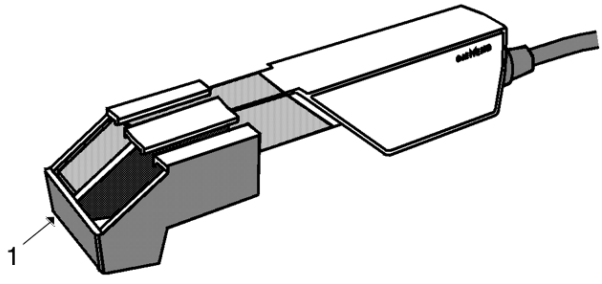
1 Side A (flat surface)

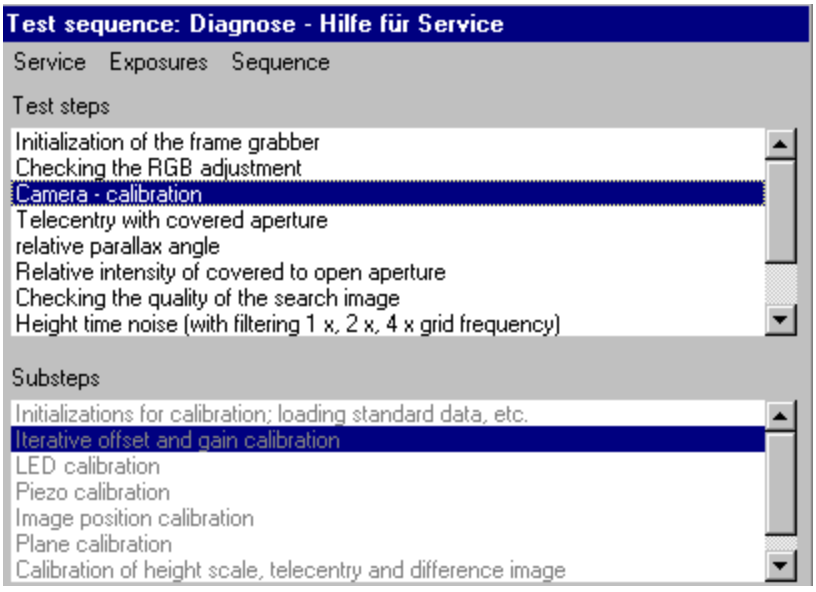
Calibration Set B

If Box **B** appears, please set Calibration Set **B** to the 3D camera.



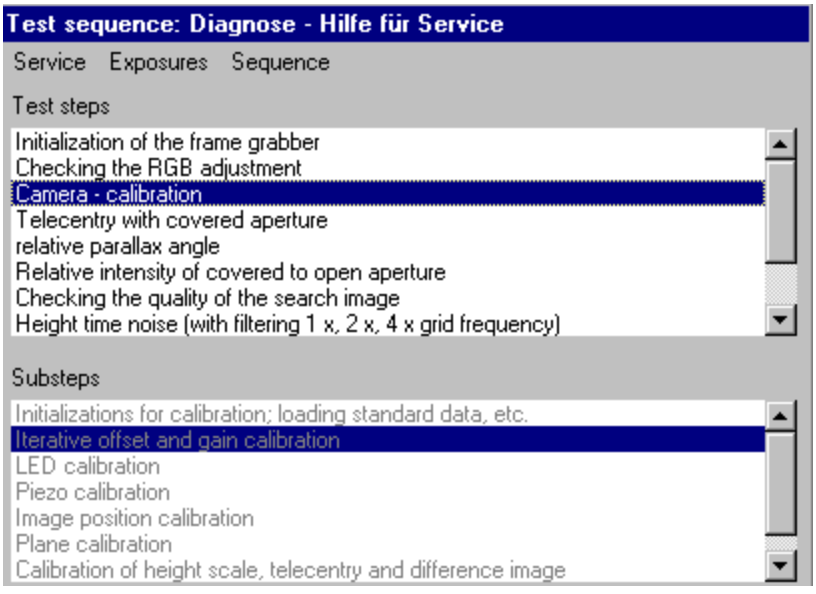
Camera calibration




Test sequence: Diagnose - Hilfe für Service
Service
Exposures
Sequence
Test steps
Initialization of the frame grabber
Checking the RGB adjustment
Camera - calibration
Telecentry with covered aperture
relative parallax angle
Relative intensity of covered to open aperture
Checking the quality of the search image
Height time noise (with filtering 1 x, 2 x, 4 x grid frequency)
Substeps
Initializations for calibration; loading standard data, etc.
Iterative offset and gain calibration
LED calibration
Piezo calibration
Image position calibration
Plane calibration
Calibration of height scale, telecentry and difference image

Result

If a yellow results box appears, select the Next button to continue the sequence.


Test sequence: Diagnose - Hilfe für Service
Service
Exposures
Sequence
Test steps
Initialization of the frame grabber
Checking the RGB adjustment
Camera - calibration
Telecentry with covered aperture
relative parallax angle
Relative intensity of covered to open aperture
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Height time noise (with filtering 1 x, 2 x, 4 x grid frequency)
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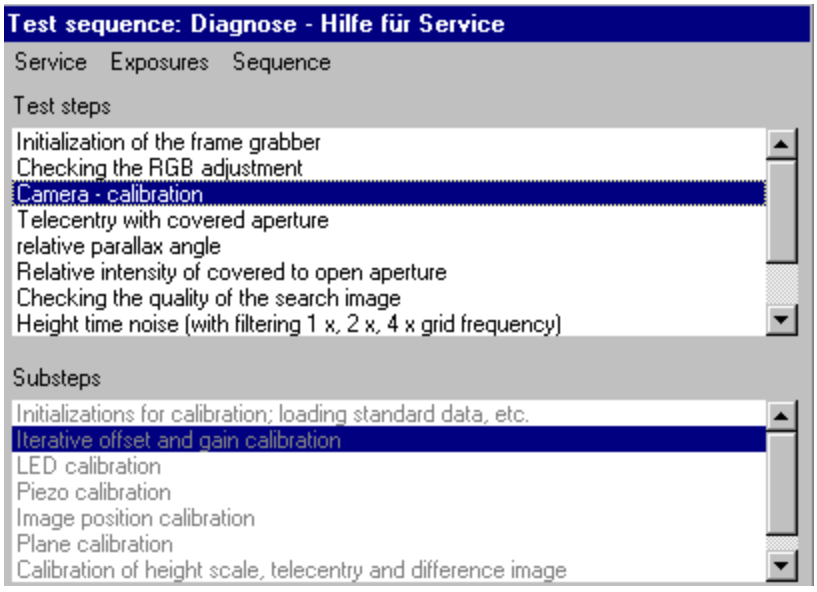
LOG box

The results of the completed test steps are shown in the LOG box during the sequence.

The entire LOG box can be viewed by scrolling up/down.


Test sequence: Diagnose - Hilfe für Service
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Piezo calibration
Image position calibration
Plane calibration
Calibration of height scale, telecentry and difference image

Errors can occur while you are carrying out the test steps. Here, it is important to follow the instructions.

The camera quick test also includes several Service functions, which can be started in the Service menu and in the pull-down menus.

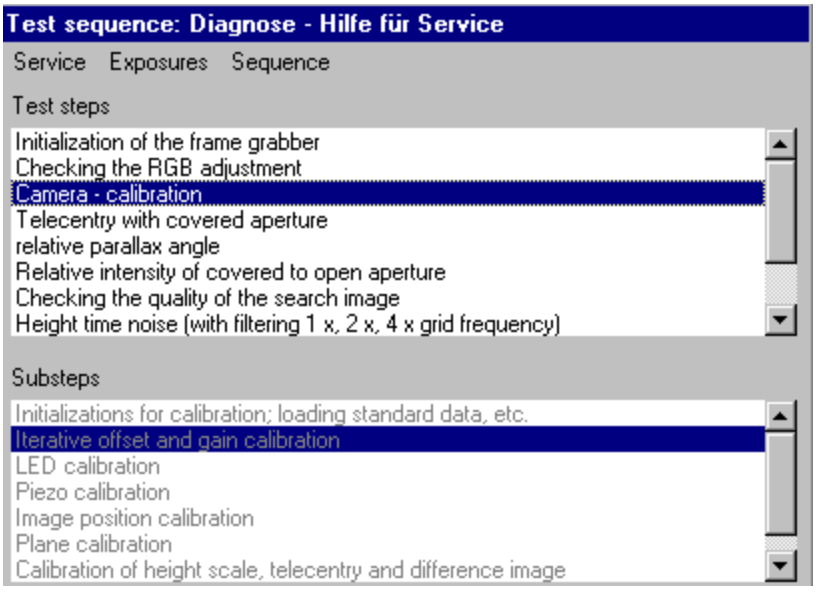
NOTE:
Service functions can only be selected when the test run is stopped.

To end a service function, select a button to continue the test run (e.g. Next).

Service functions consist of:

- Protocol
- Live image
- Lifting magnet
- LED
- Slide alignment

Protocol


Test sequence: Diagnose - Hilfe für Service
Service
Exposures
Sequence
Test steps
Initialization of the frame grabber
Checking the RGB adjustment
Camera - calibration
Telecentry with covered aperture
relative parallax angle
Relative intensity of covered to open aperture
Checking the quality of the search image
Height time noise (with filtering 1 x, 2 x, 4 x grid frequency)
Substeps
Initializations for calibration; loading standard data, etc.
Iterative offset and gain calibration
LED calibration
Piezo calibration
Image position calibration
Plane calibration
Calibration of height scale, telecentry and difference image

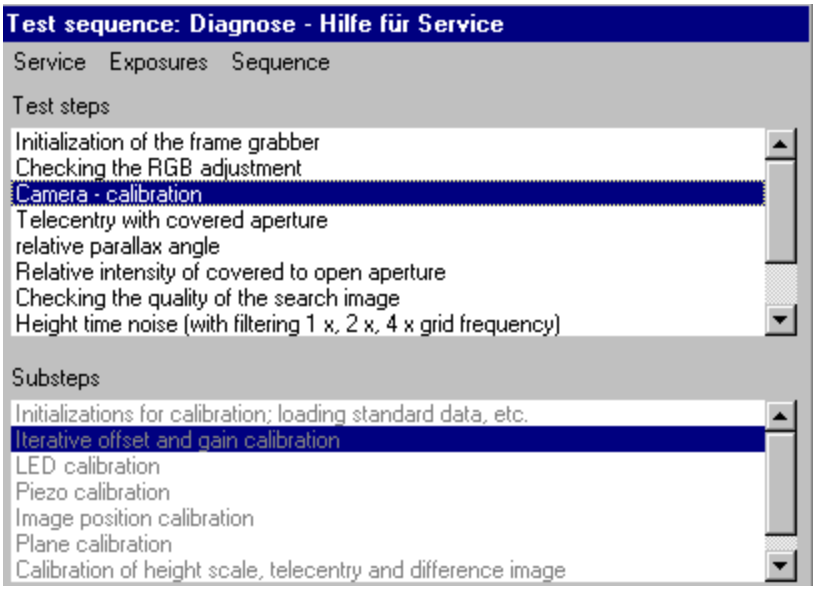
Protocol

Select "Service"/"Protocol"/"save" to create a protocol (log file) during the test run.

To view the protocol, select "Service"/"Protocol"/Display.

Select "Return" to close the protocol (log file) display.

Live image


Test sequence: Diagnose - Hilfe für Service
Service
Exposures
Sequence
Test steps
Initialization of the frame grabber
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relative parallax angle
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Height time noise (with filtering 1 x, 2 x, 4 x grid frequency)
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Piezo calibration
Image position calibration
Plane calibration
Calibration of height scale, telecentry and difference image

Live image

Moving grid = Search image

Int. LED on (standing grid) = Search image with standing grid - visible grid stripes

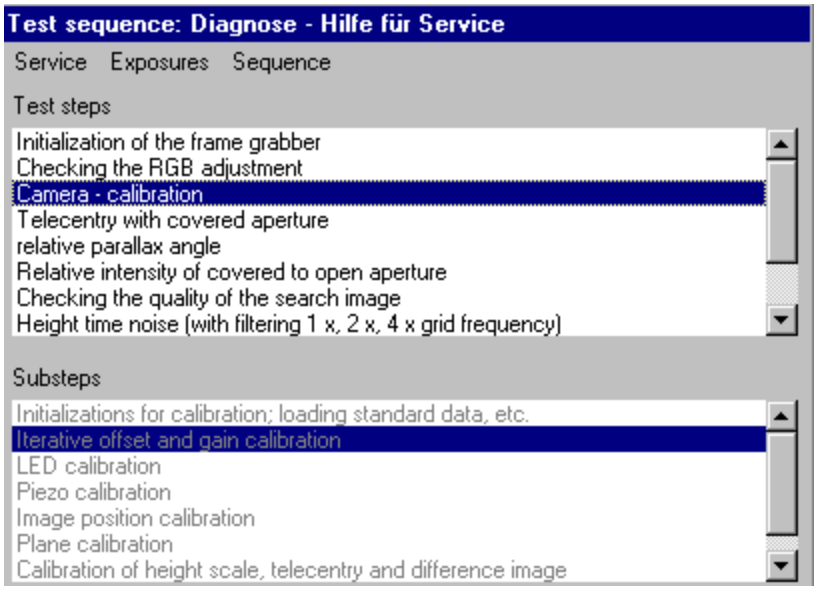
Int. LED off (standing grid) = Search image with internal LED deactivated, so that objects can only be seen when they are illuminated externally.

Lifting magnet

The lifting magnet is attracted approximately every 3 sec. for a period of approx. 1 sec. A clicking sound can be heard.

LED and slide alignment are not required in the camera quick test.

The camera quick test sequence comprises the test steps (functions) listed below.


Test sequence: Diagnose - Hilfe für Service
Service
Exposures
Sequence
Test steps
Initialization of the frame grabber
Checking the RGB adjustment
Camera - calibration
Telecentry with covered aperture
relative parallax angle
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Height time noise (with filtering 1 x, 2 x, 4 x grid frequency)
Substeps
Initializations for calibration; loading standard data, etc.
Iterative offset and gain calibration
LED calibration
Piezo calibration
Image position calibration
Plane calibration
Calibration of height scale, telecentry and difference image

Corresponding test functions

Camera calibration data obtained from successfully completed tests are saved and used in the following camera quick test. These data are not used for camera operation outside the service program, so that the recording process is not affected by the program.

This also means that the camera must be calibrated before it is used in the camera quick test. This enables the test steps to produce correct results. Checking the RGB adjustment is the only test step which can produce correct results without the calibration process being completed.

The test results are indicated in three colors: Green = fully passed, Yellow = passed, Red = not passed.

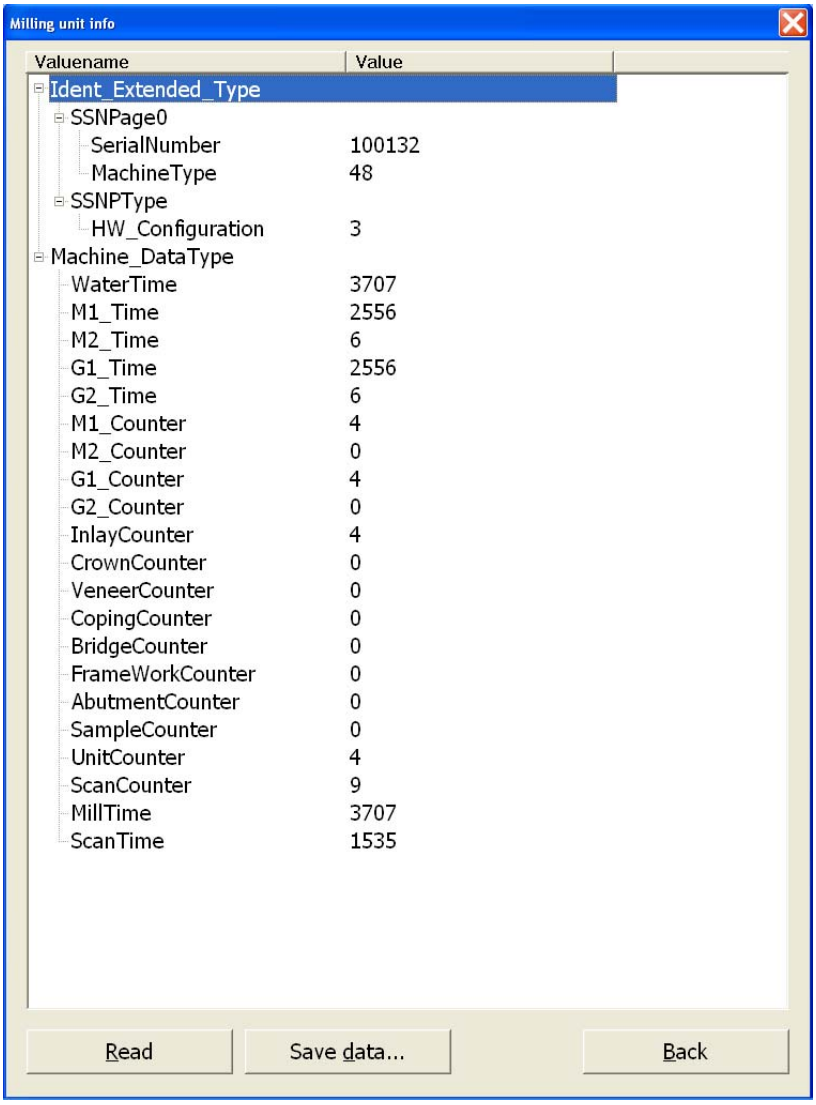
CAUTION:
Failed tests may be due to a badly prepared calibration set. The uniformity of the powder coating should then be checked. It should also be noted that test failures may be the result of a faulty camera cable or PC slide-in module.

In the test step labeled Entry of the header data, a 4 to 6 digit number must be entered for the serial number (card).

Carrying out the Closing the frame grabber test step involves generating a protocol (log file) of the completed tests to be stored as a file in the \"CEREC"\"System"\"Service"\"Protocols" folder. The file name includes the date and time of the test as well as the camera serial number, if this was entered in the Entry of the header data test step. If a test step has been carried out several times, the latest result is entered in the protocol.

2.3.14 Milling Unit Info

This dialog box contains information on the connected milling unit and the milling times of the burrs.



Milling Unit Info

SerialNumber	Serial number of milling unit	
MachineType	Machine type	32 = CEREC MC XL
		48 = inLab MC XL
HW_configuration	Hardware configuration	3 = inLab MC XL
		4 = CEREC MC XL
		5 = CEREC MC XL + scanner
		6 = CEREC MC XL + 4 motors
		7 = CEREC MC XL + scanner + 4 motors
Water Time	Time since last water change	
M1_Time	Milling time of DC motor referenced to burr (right)	
M2_Time		
G1_Time	Milling time of DC motor referenced to burr (left)	
G2_Time		
M1_Counter	Number of units referenced to burrs used	
M2_Counter		
G1_Counter		
G2_Counter		
InlayCounter	Number of inlays, crowns, veneers, copings, anatomic bridges, frameworks, abutments and test pieces	
CrownCounter		
VeneerCounter		
CopingCounter		
BridgeCounter		
FrameWorkCounter		
AbutmentCounter		
SampleCounter		
Unit Counter	Total number of units	
ScanCounter	Total number of scan units	
MillTime	Total milling time	
ScanTime	Total scanning time	

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The Dental Company

Troubleshooting

CEREC / inLab MC XL

3 Troubleshooting

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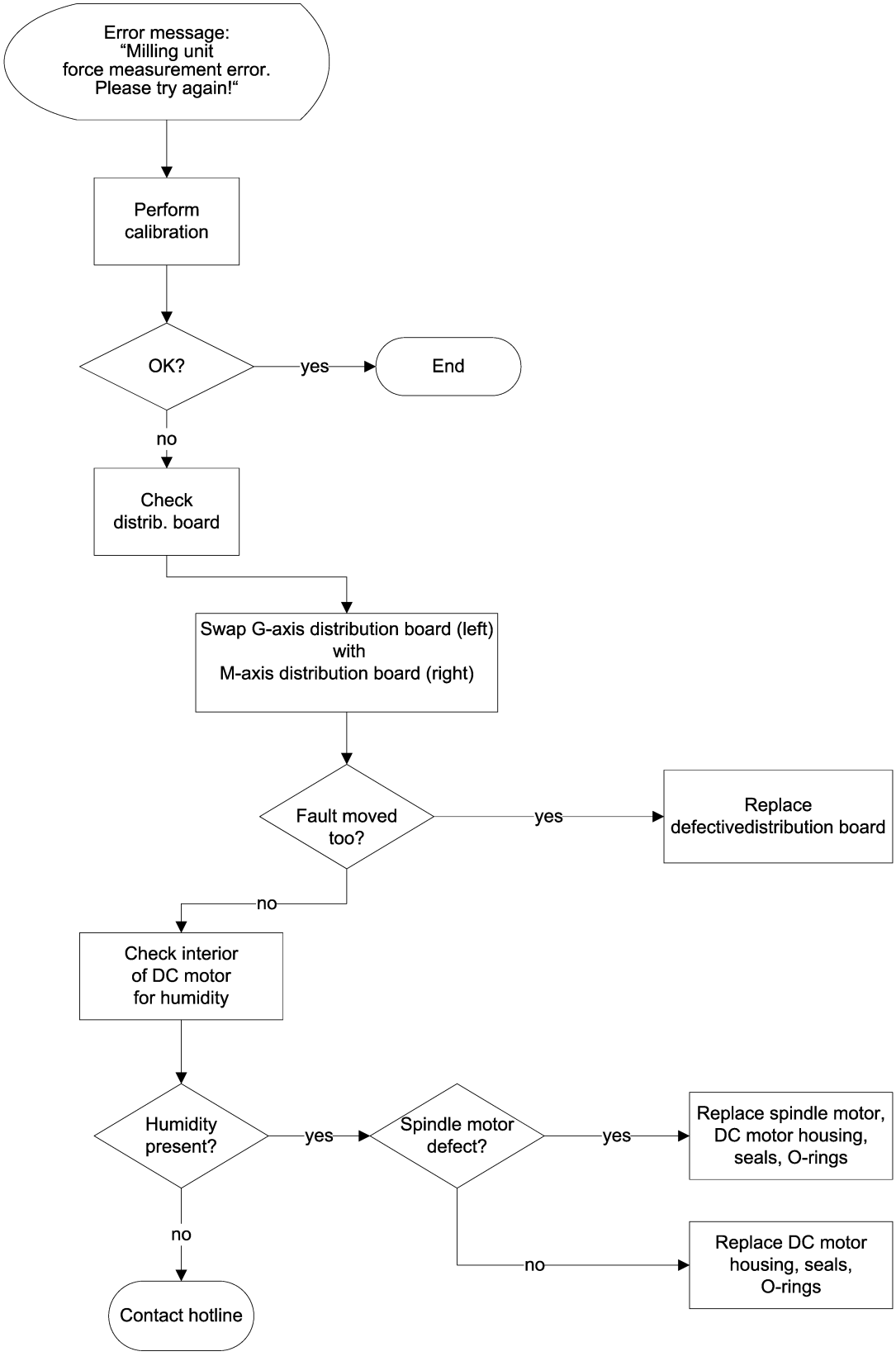
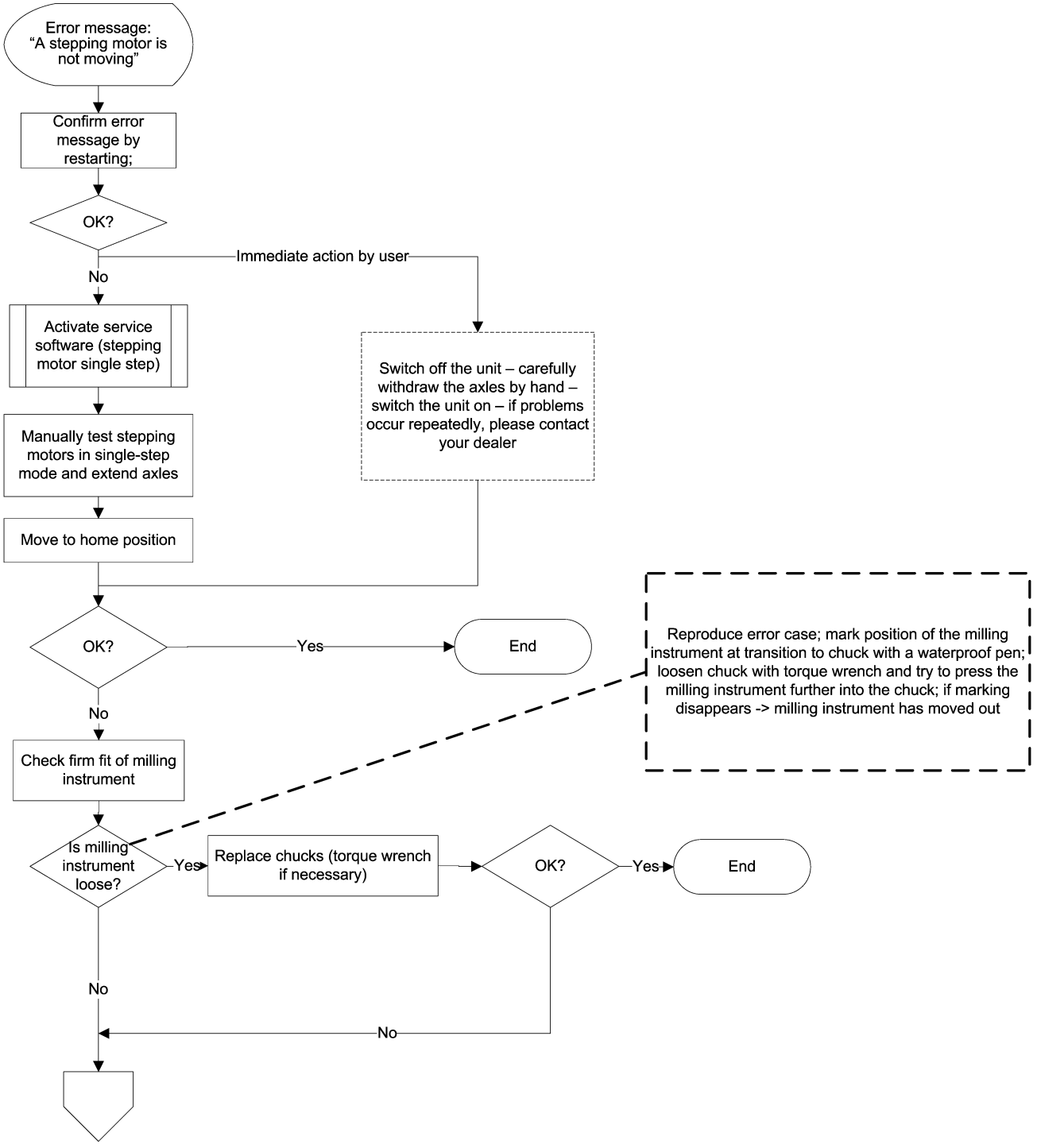
3.1 Force measurement errors

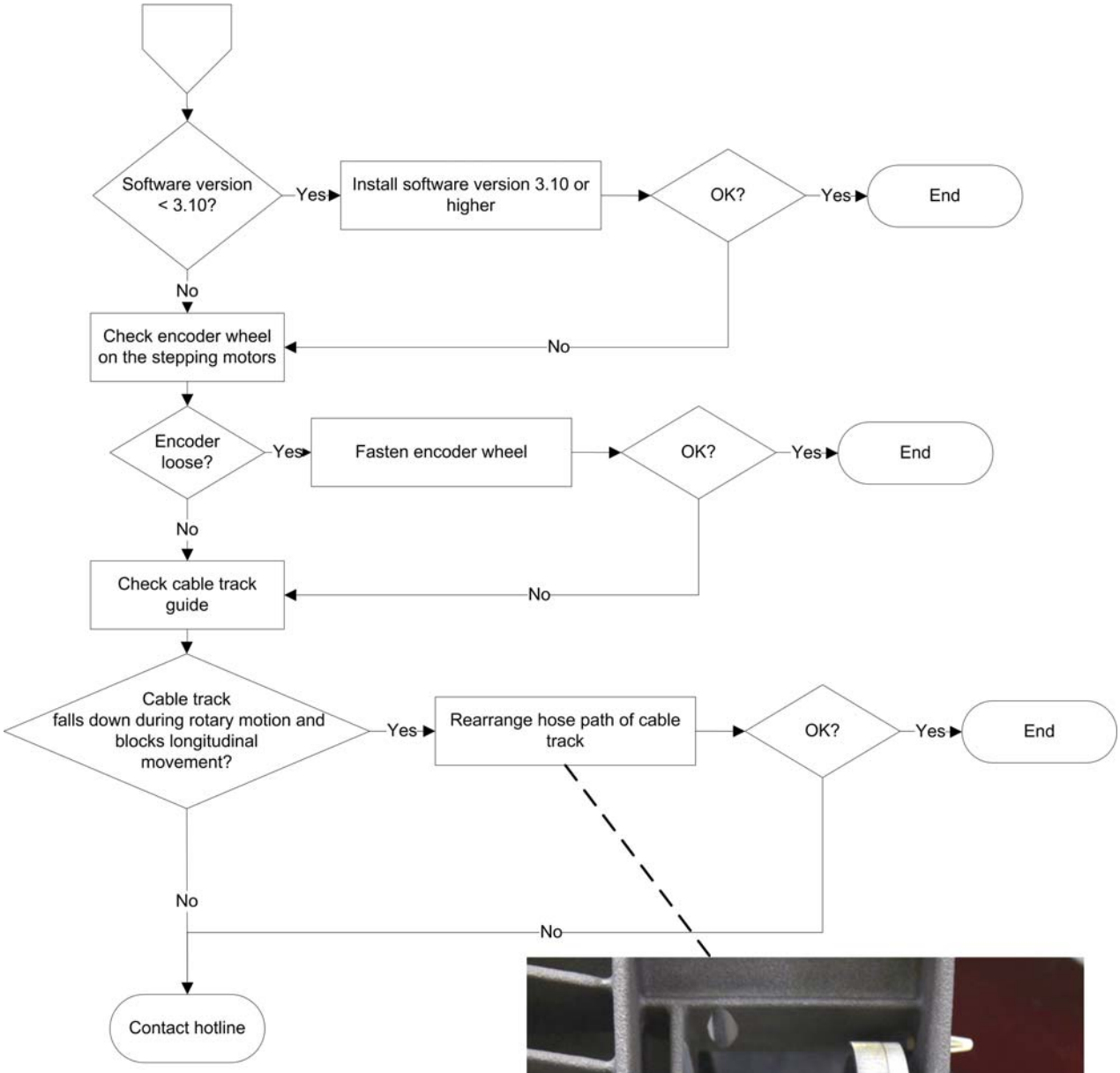


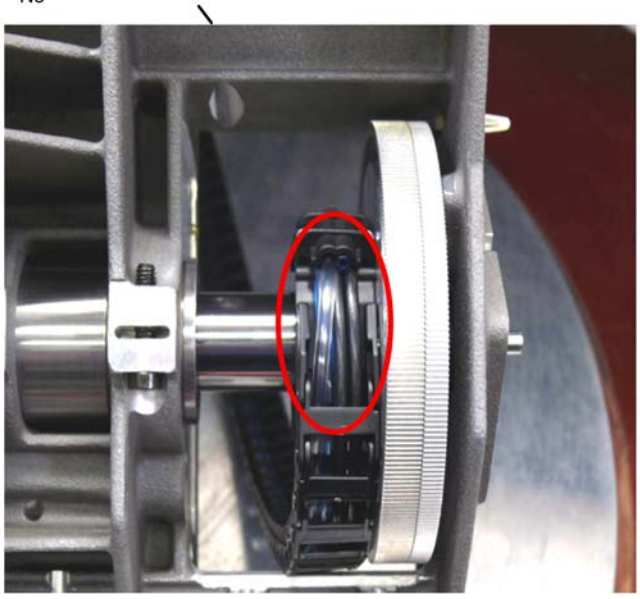
3.2 Stepping motor does not move


Error message: "A stepping motor is not moving"
Confirm error message by restarting;
OK?
Immediate action by user
No
Activate service software (stepping motor single step)
Switch off the unit – carefully withdraw the axles by hand – switch the unit on – if problems occur repeatedly, please contact your dealer
Manually test stepping motors in single-step mode and extend axles
Move to home position
OK?
Yes
End
No
Reproduce error case; mark position of the milling instrument at transition to chuck with a waterproof pen; loosen chuck with torque wrench and try to press the milling instrument further into the chuck; if marking disappears -> milling instrument has moved out
Check firm fit of milling instrument
Is milling instrument loose?
Yes
Replace chucks (torque wrench if necessary)
OK?
Yes
End
No
No

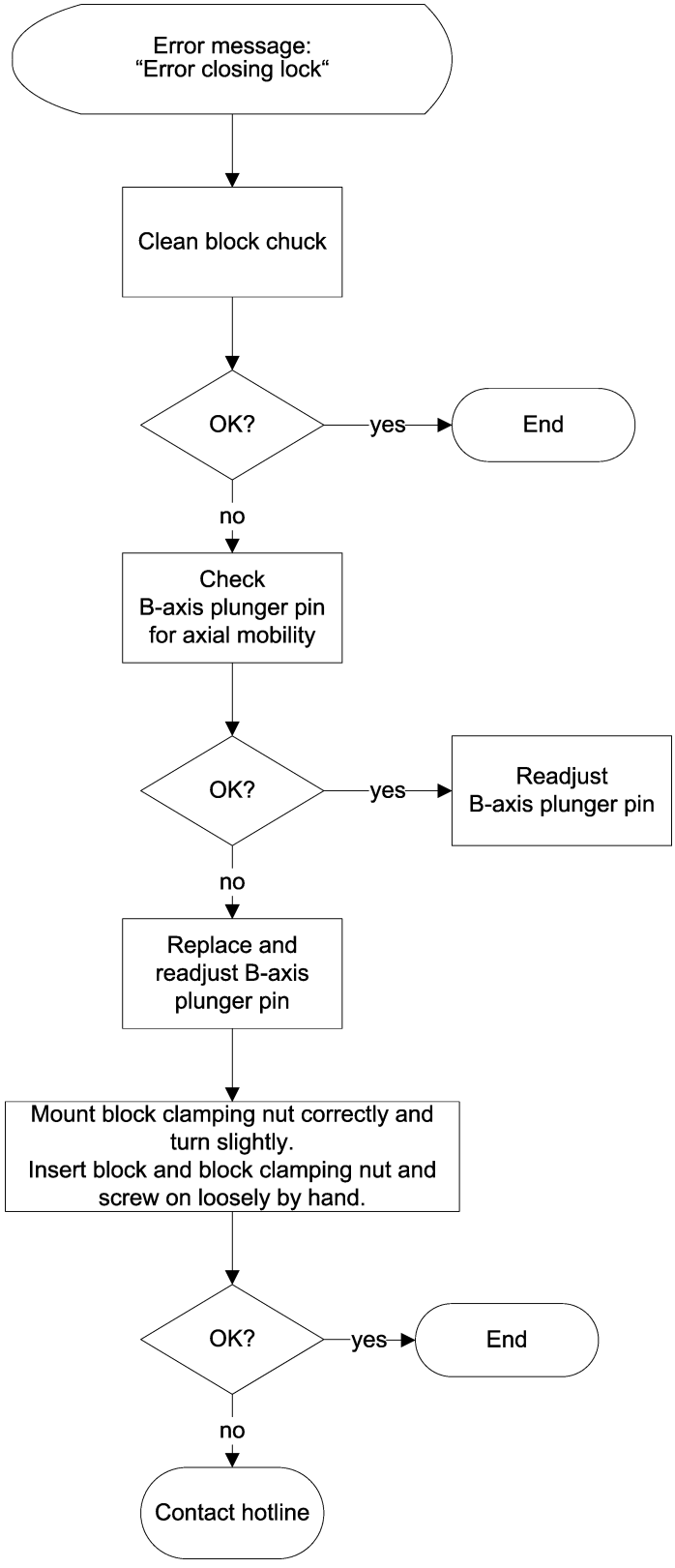
Continued on next page

Continued from previous page

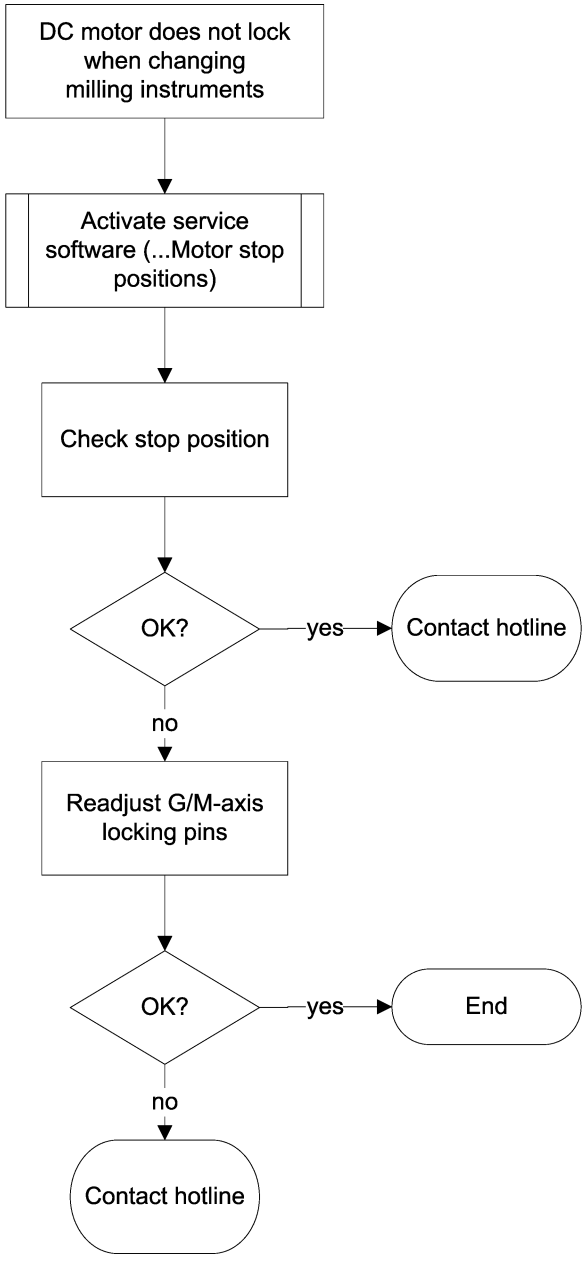




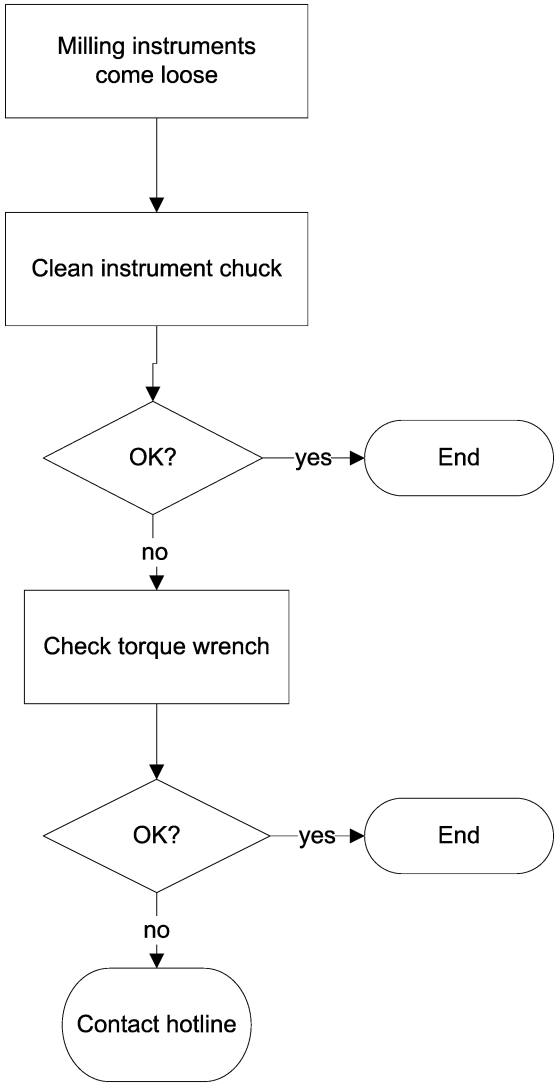
3.3 Faulty locking of block chuck



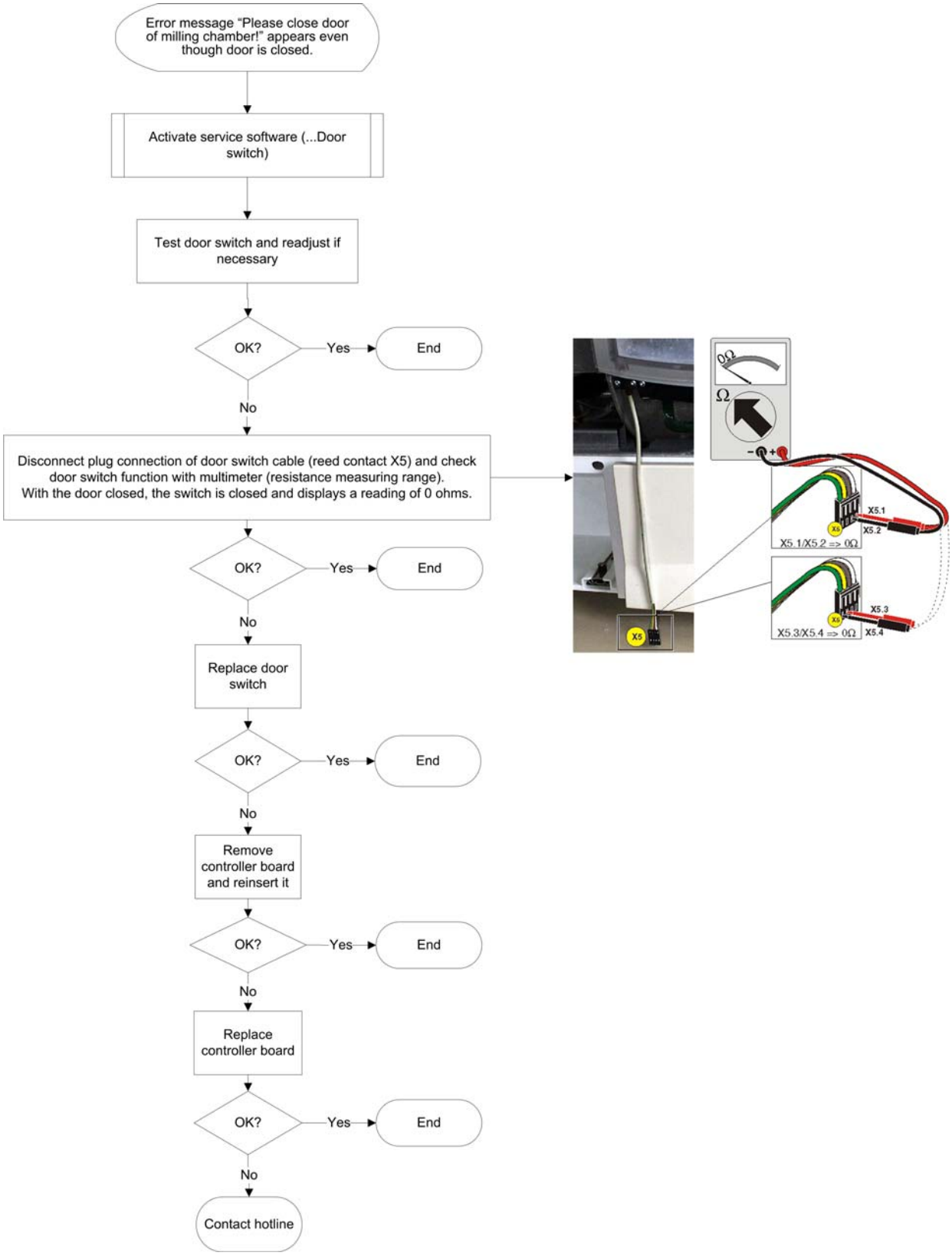
3.4 DC motor does not lock



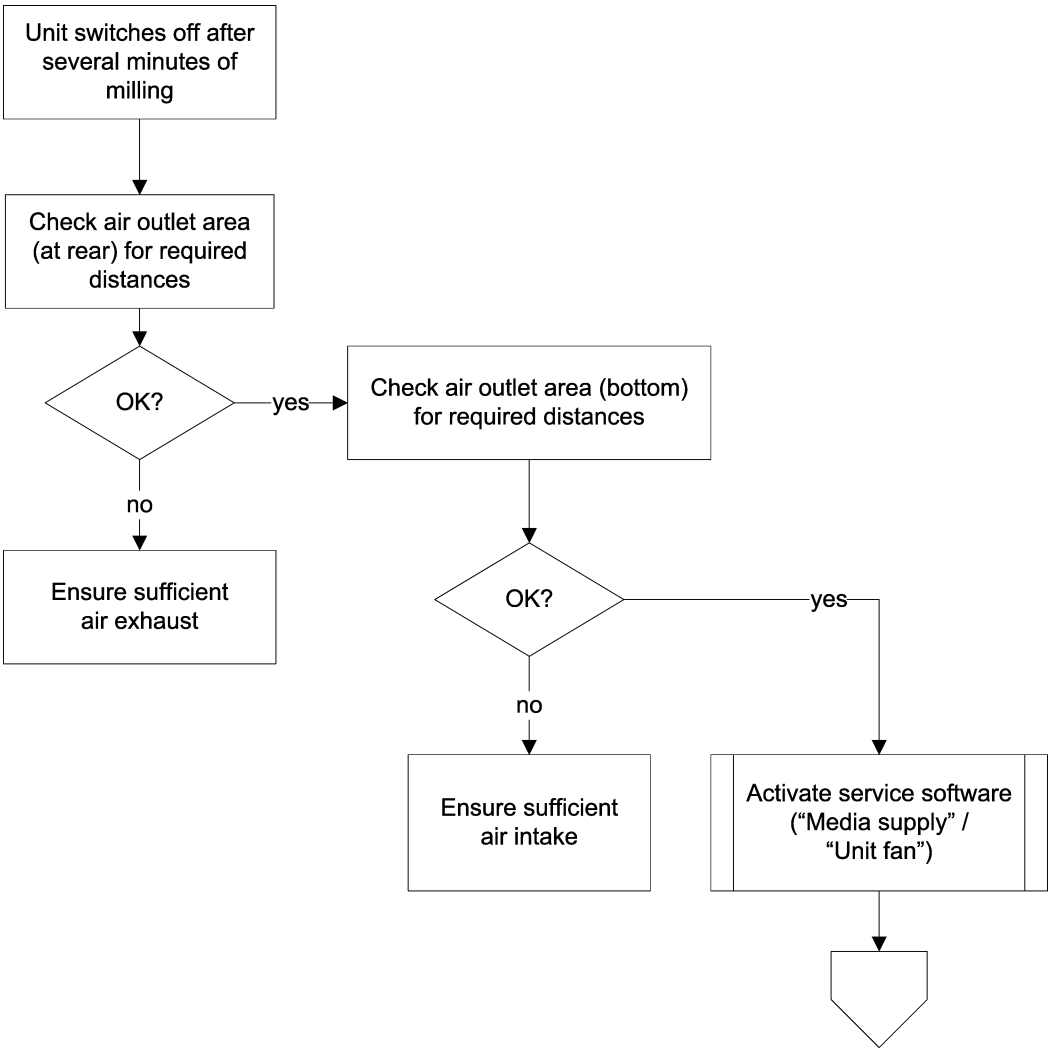
3.5 Milling instruments come loose



3.6 Milling chamber door switch

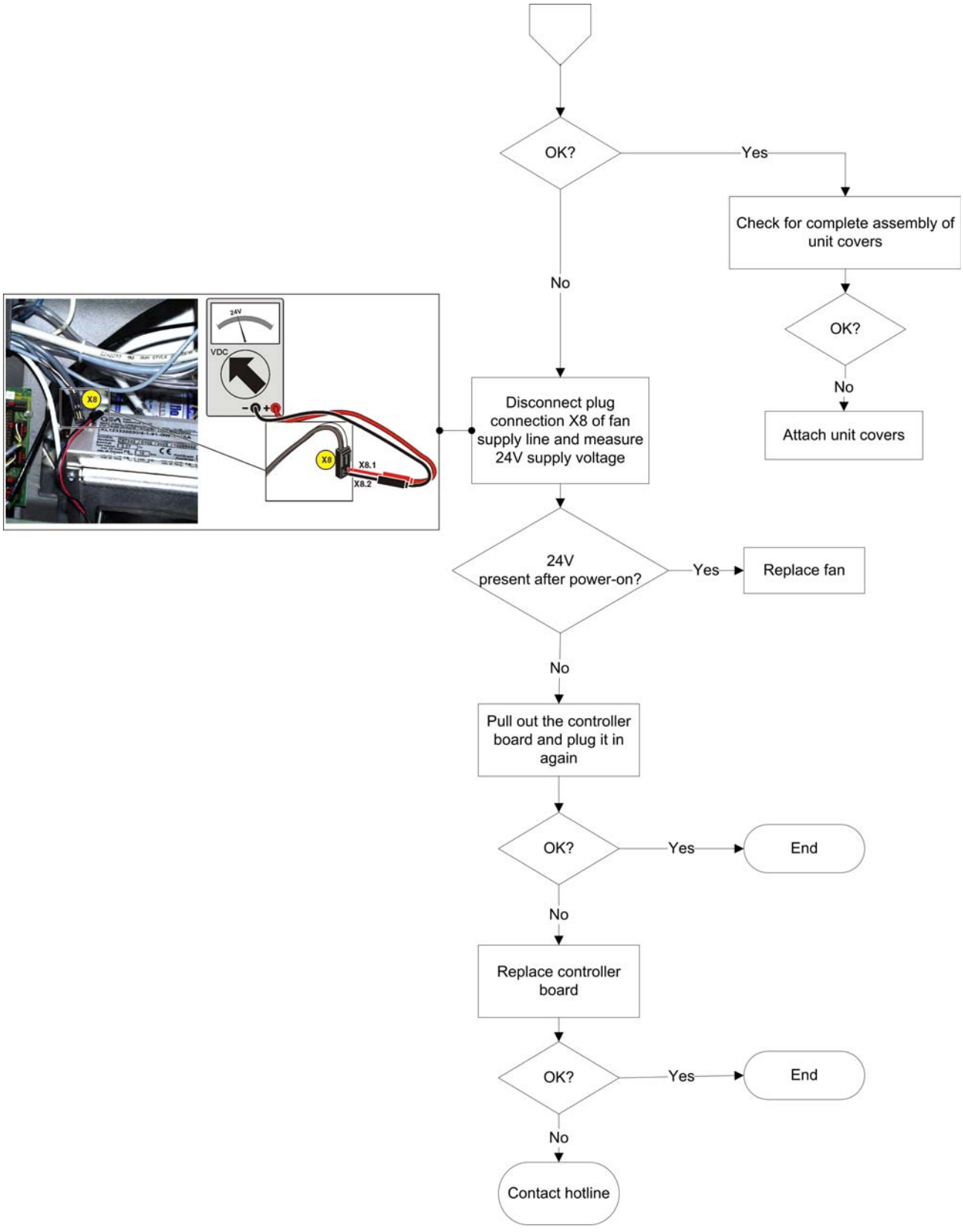


3.7 Unit switches off

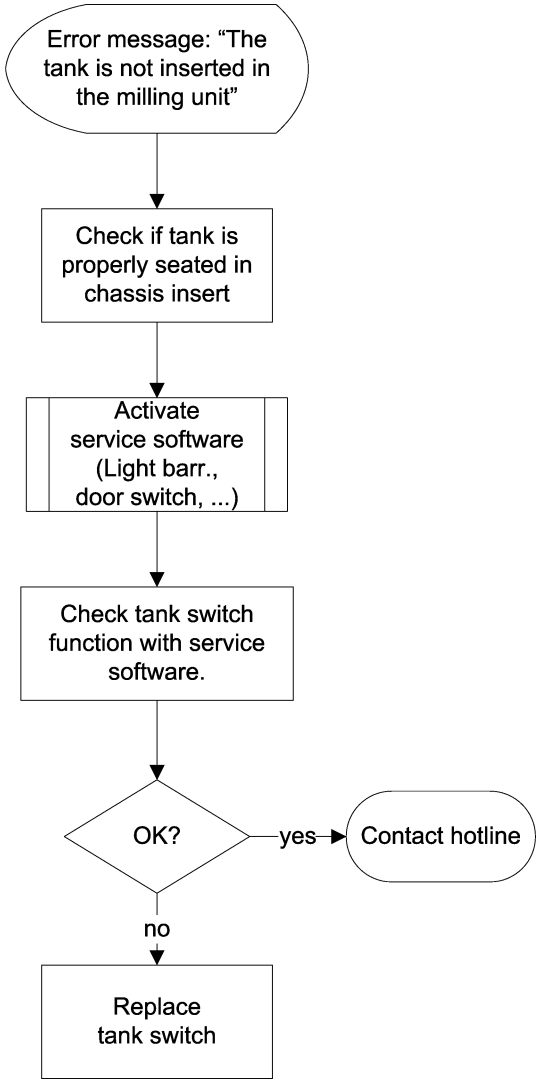


Continued on next page

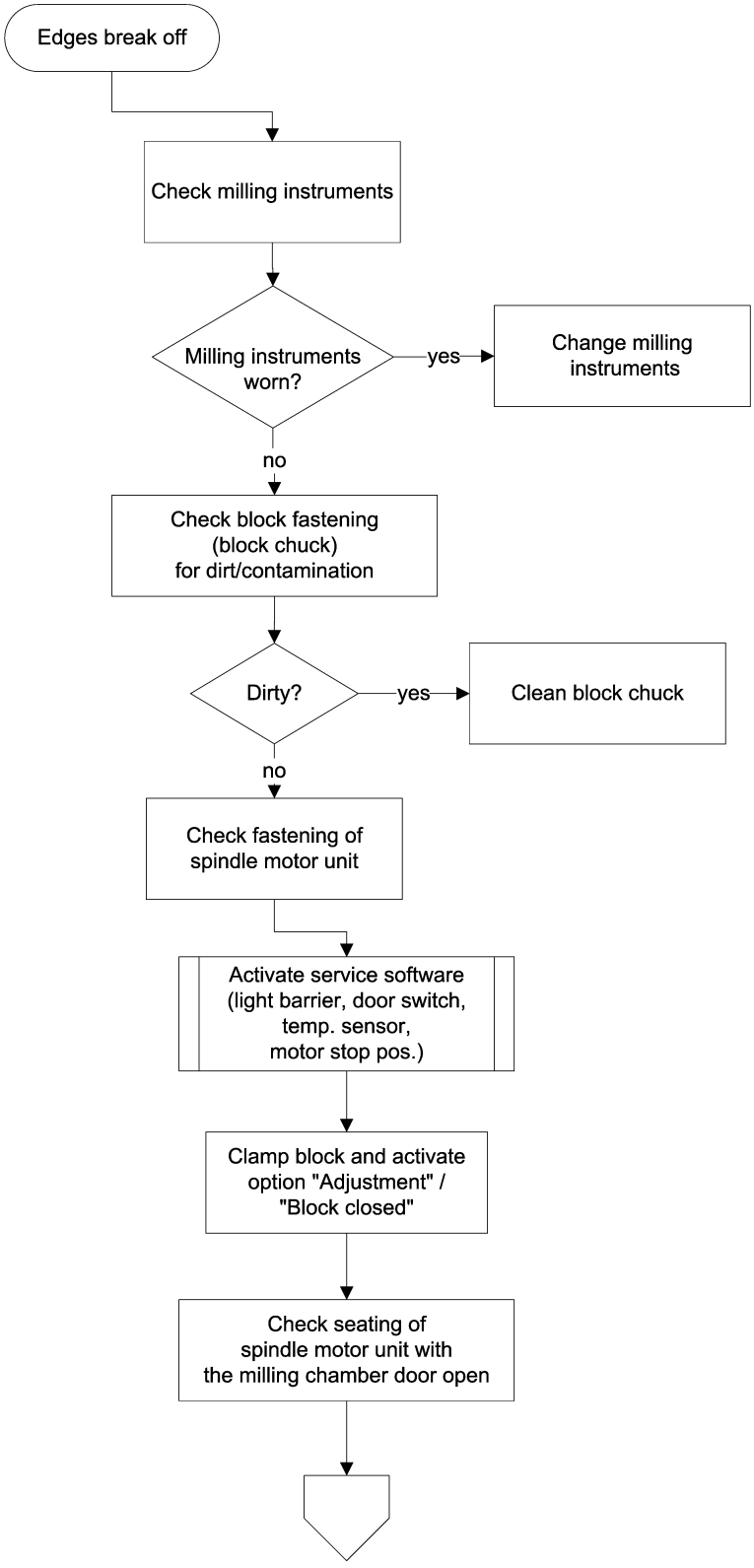
Continued from previous page



3.8 Tank switch defect


Error message: “The tank is not inserted in the milling unit”
Check if tank is properly seated in chassis insert
Activate service software (Light barr., door switch, ...)
Check tank switch function with service software.
OK?
yes
Contact hotline
no
Replace tank switch

3.9 Edges break off


Edges break off
Check milling instruments
Milling instruments worn?
yes
Change milling instruments
no
Check block fastening (block chuck) for dirt/contamination
Dirty?
yes
Clean block chuck
no
Check fastening of spindle motor unit
Activate service software (light barrier, door switch, temp. sensor, motor stop pos.)
Clamp block and activate option "Adjustment" / "Block closed"
Check seating of spindle motor unit with the milling chamber door open

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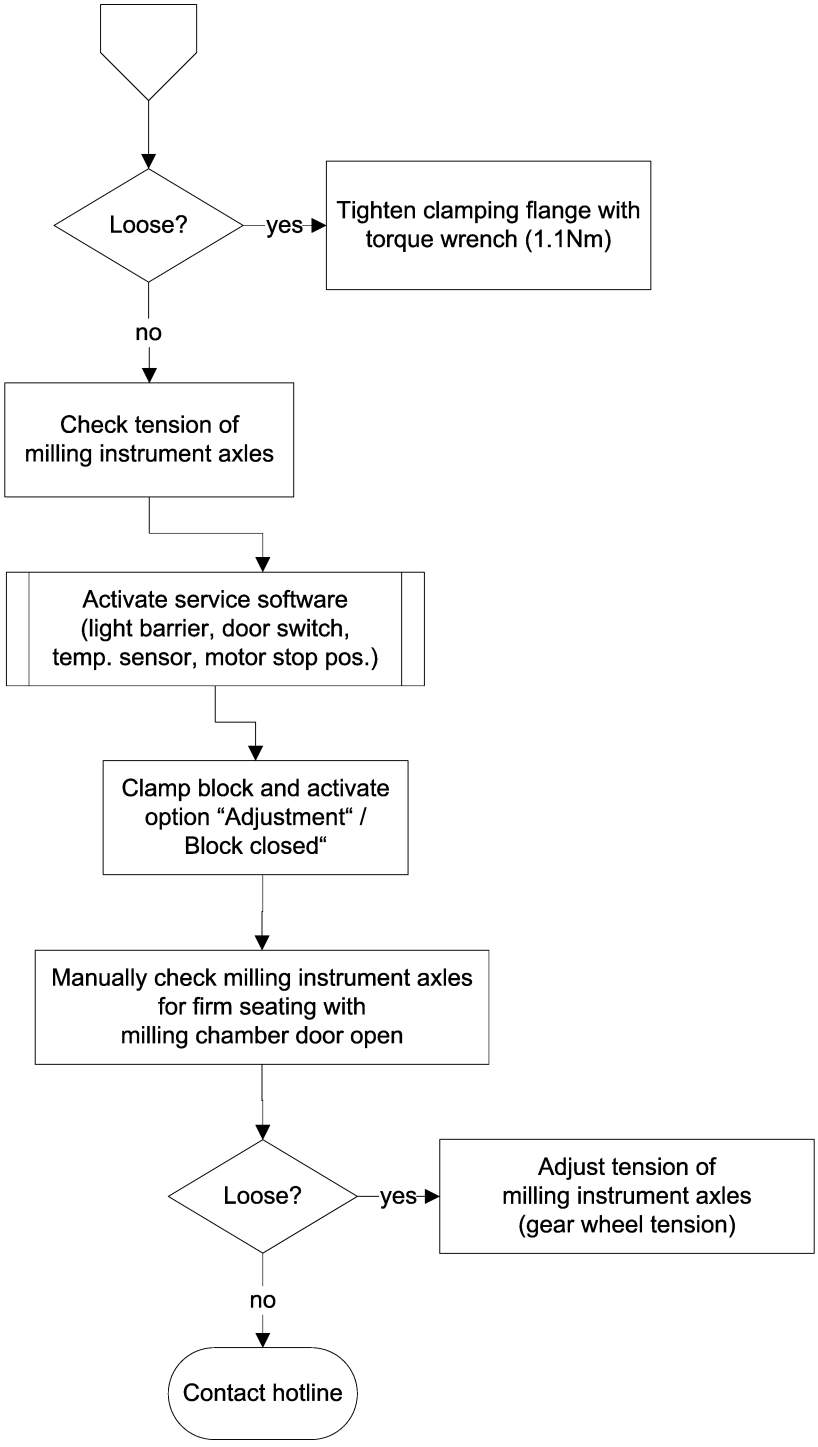
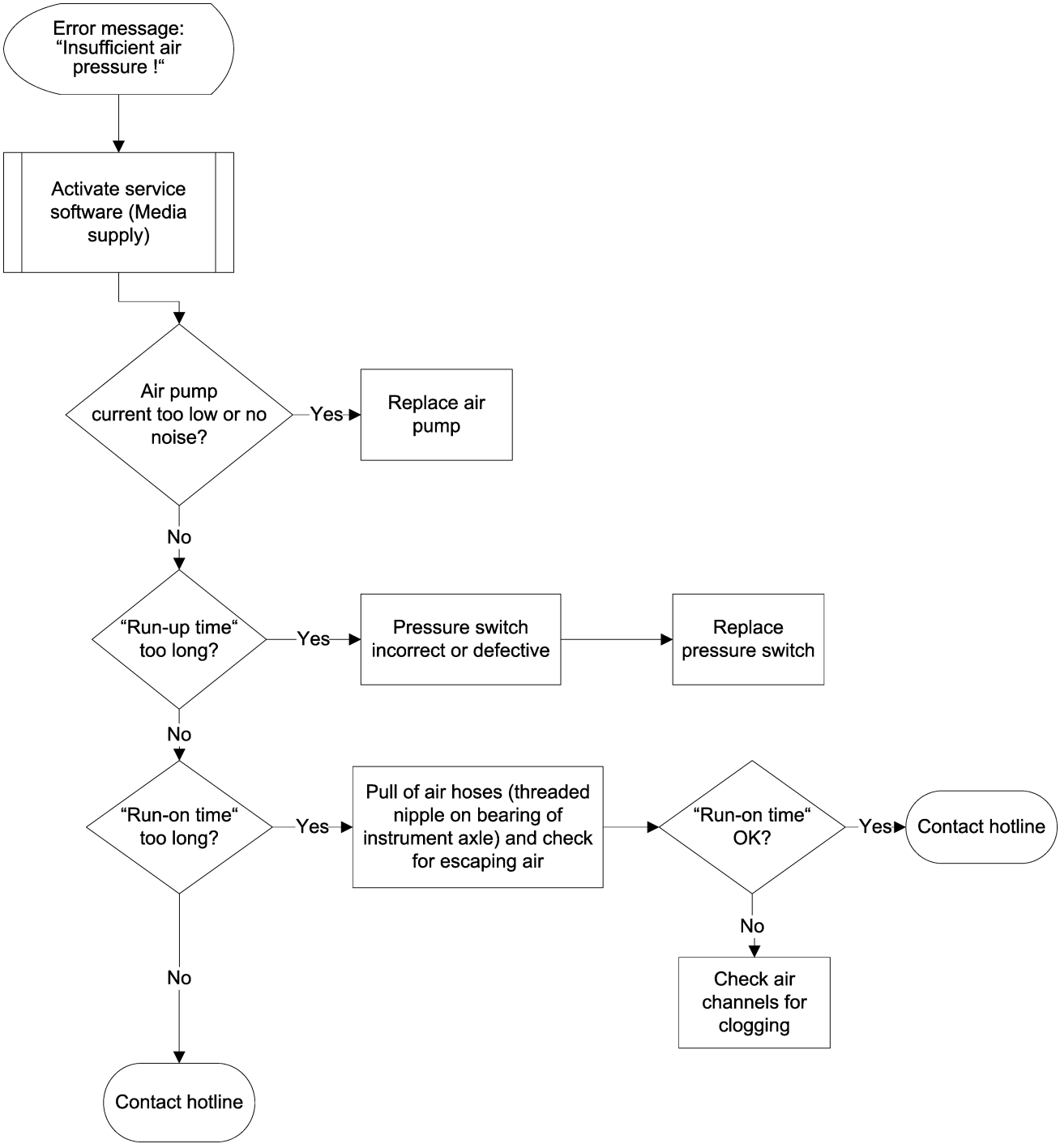
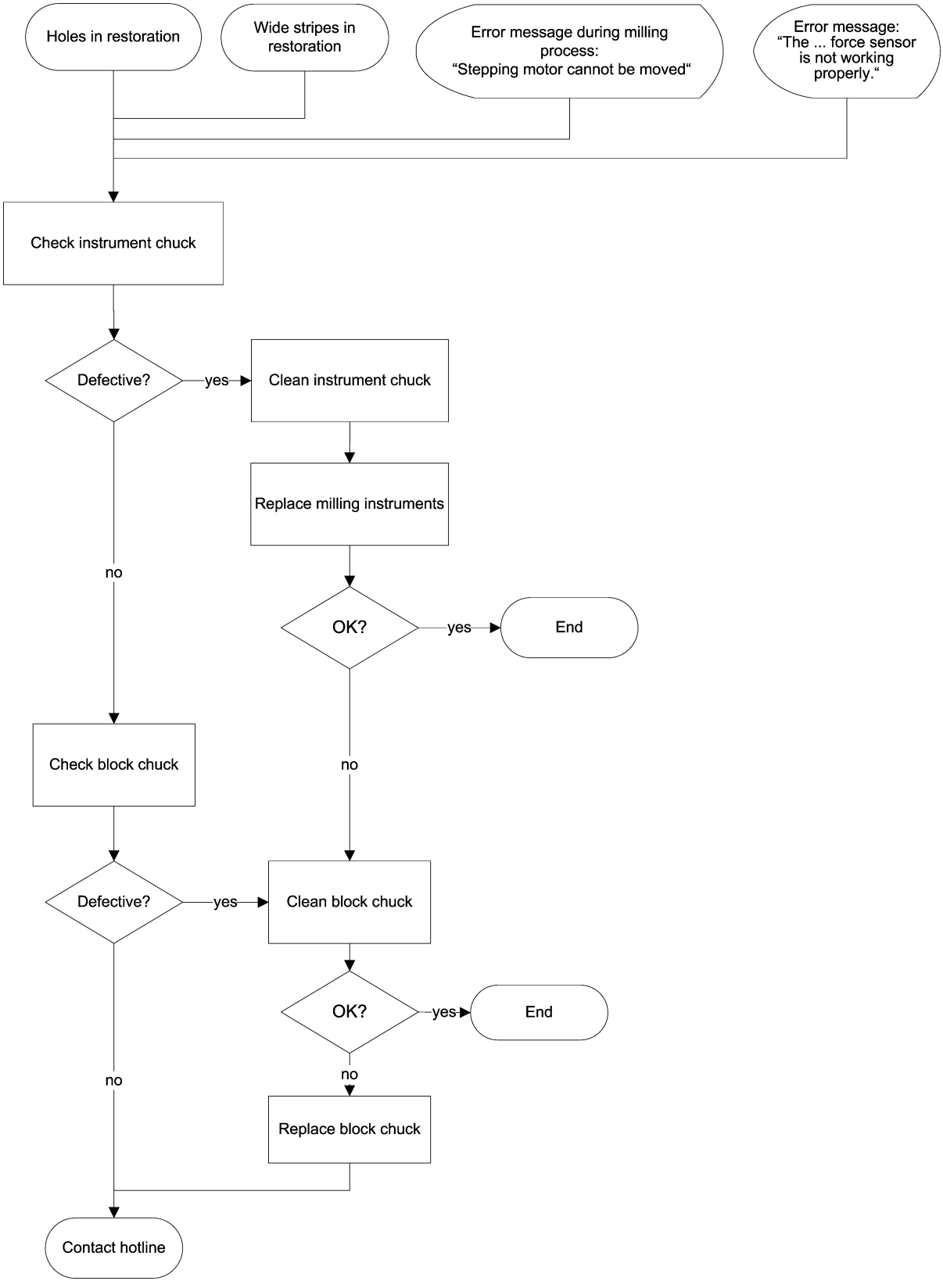

Loose?
yes
Tighten clamping flange with torque wrench (1.1Nm)
no
Check tension of milling instrument axles
Activate service software (light barrier, door switch, temp. sensor, motor stop pos.)
Clamp block and activate option “Adjustment“ / Block closed“
Manually check milling instrument axles for firm seating with milling chamber door open
Loose?
yes
Adjust tension of milling instrument axles (gear wheel tension)
no
Contact hotline

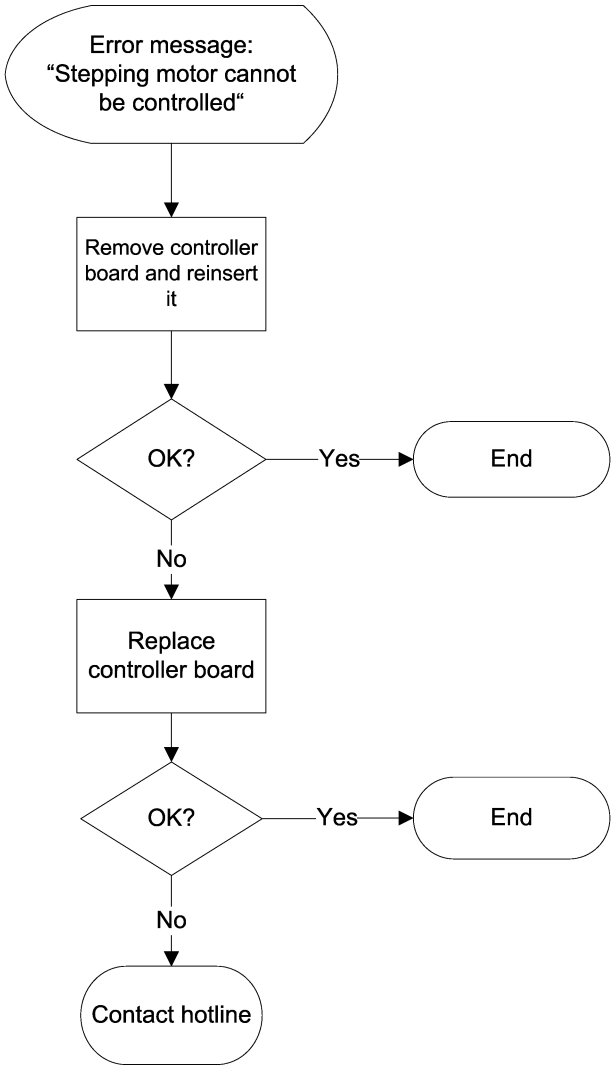
3.10 Insufficient air pressure



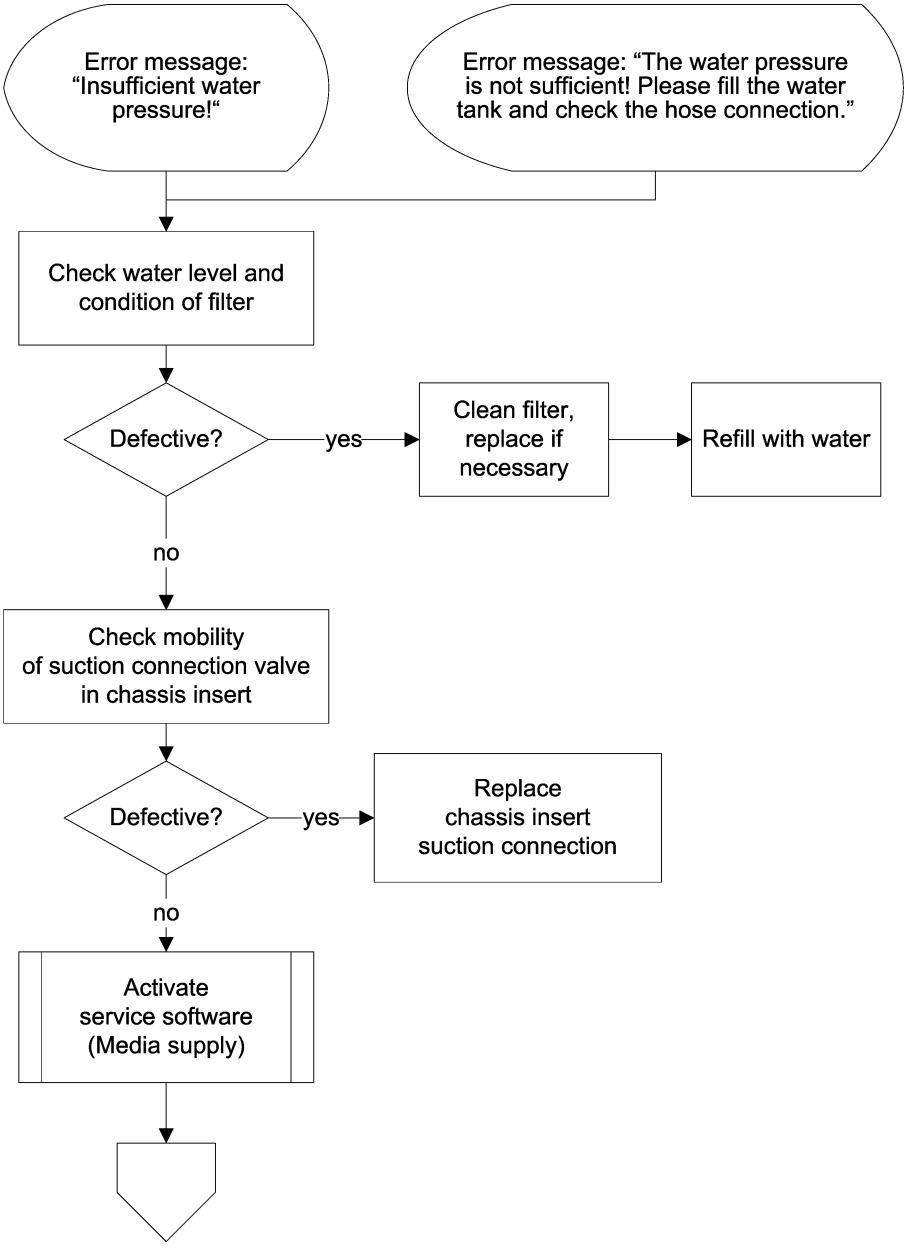
3.11 Holes in restoration



3.12 Stepping motor cannot be controlled



3.13 Faulty water pressure


Error message: “Insufficient water pressure!“
Error message: “The water pressure is not sufficient! Please fill the water tank and check the hose connection.”
Check water level and condition of filter
Defective?
yes
Clean filter, replace if necessary
Refill with water
no
Check mobility of suction connection valve in chassis insert
Defective?
yes
Replace chassis insert suction connection
no
Activate service software (Media supply)

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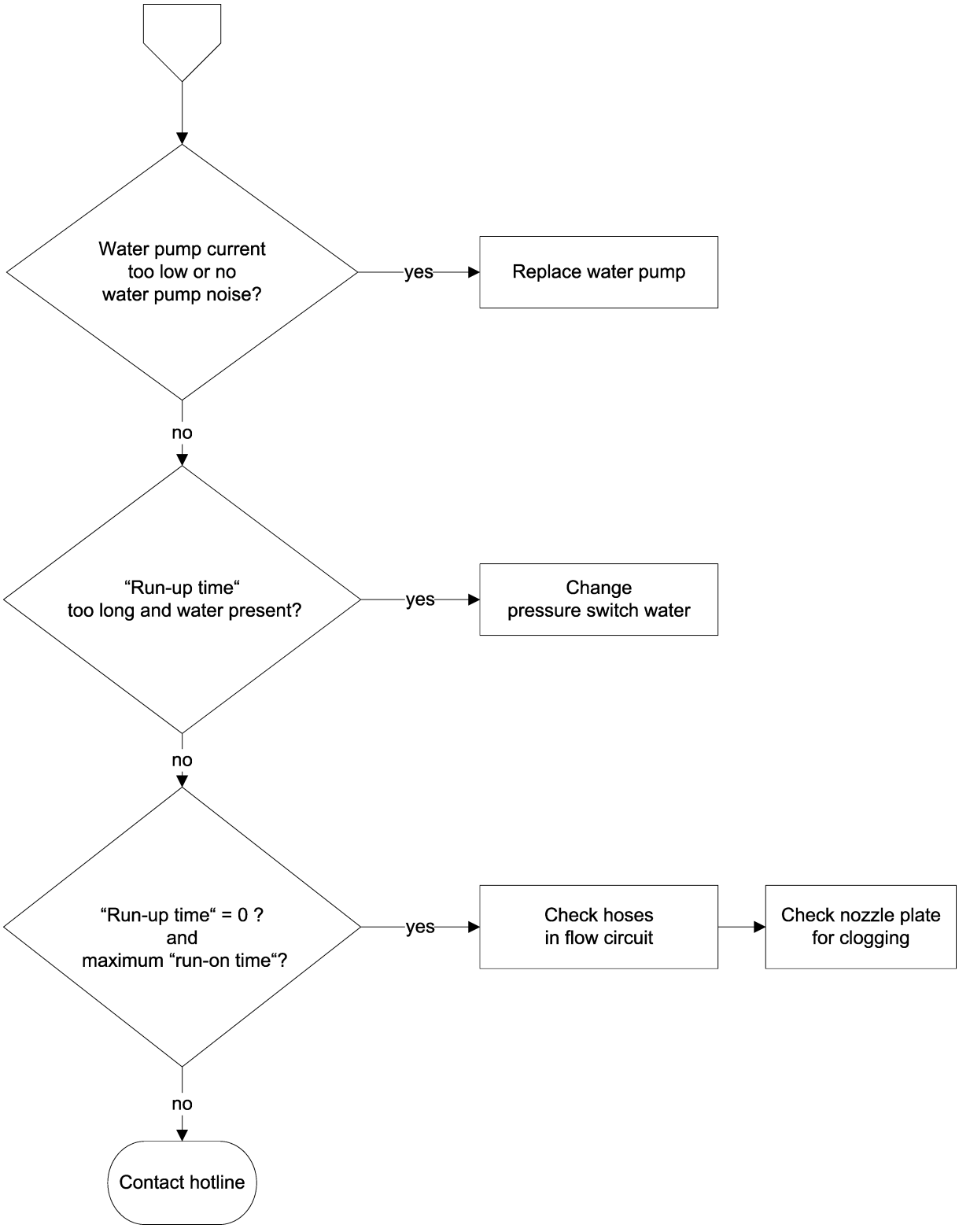
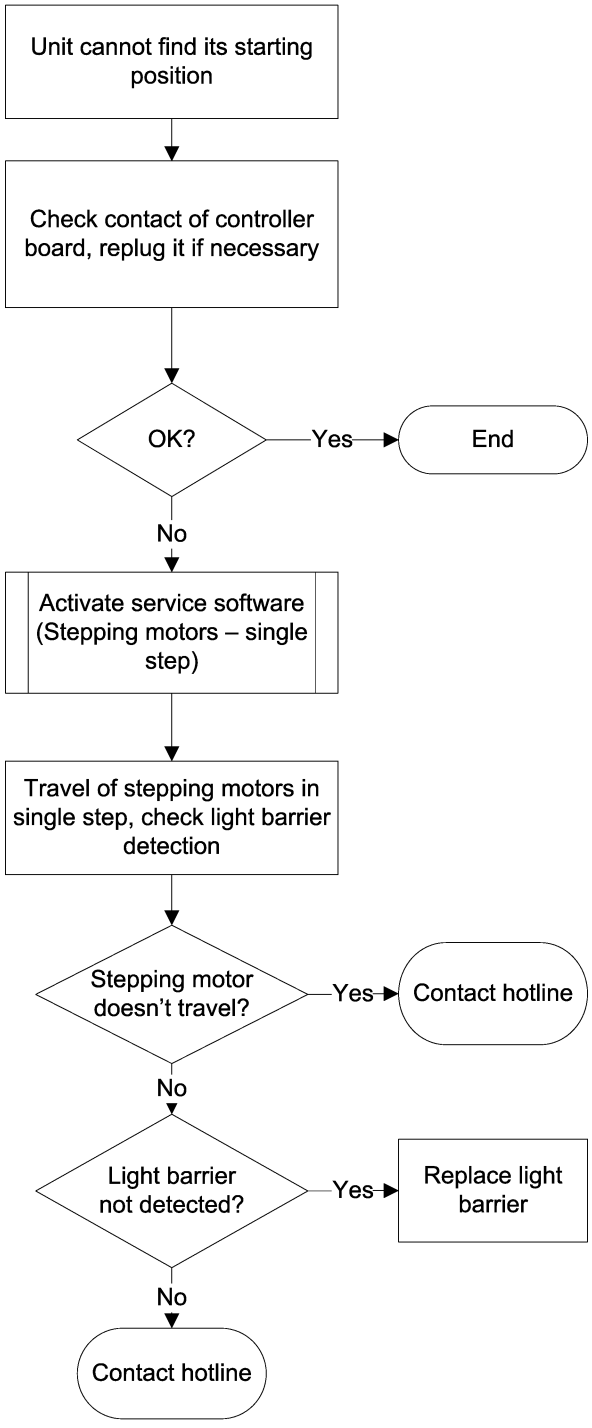
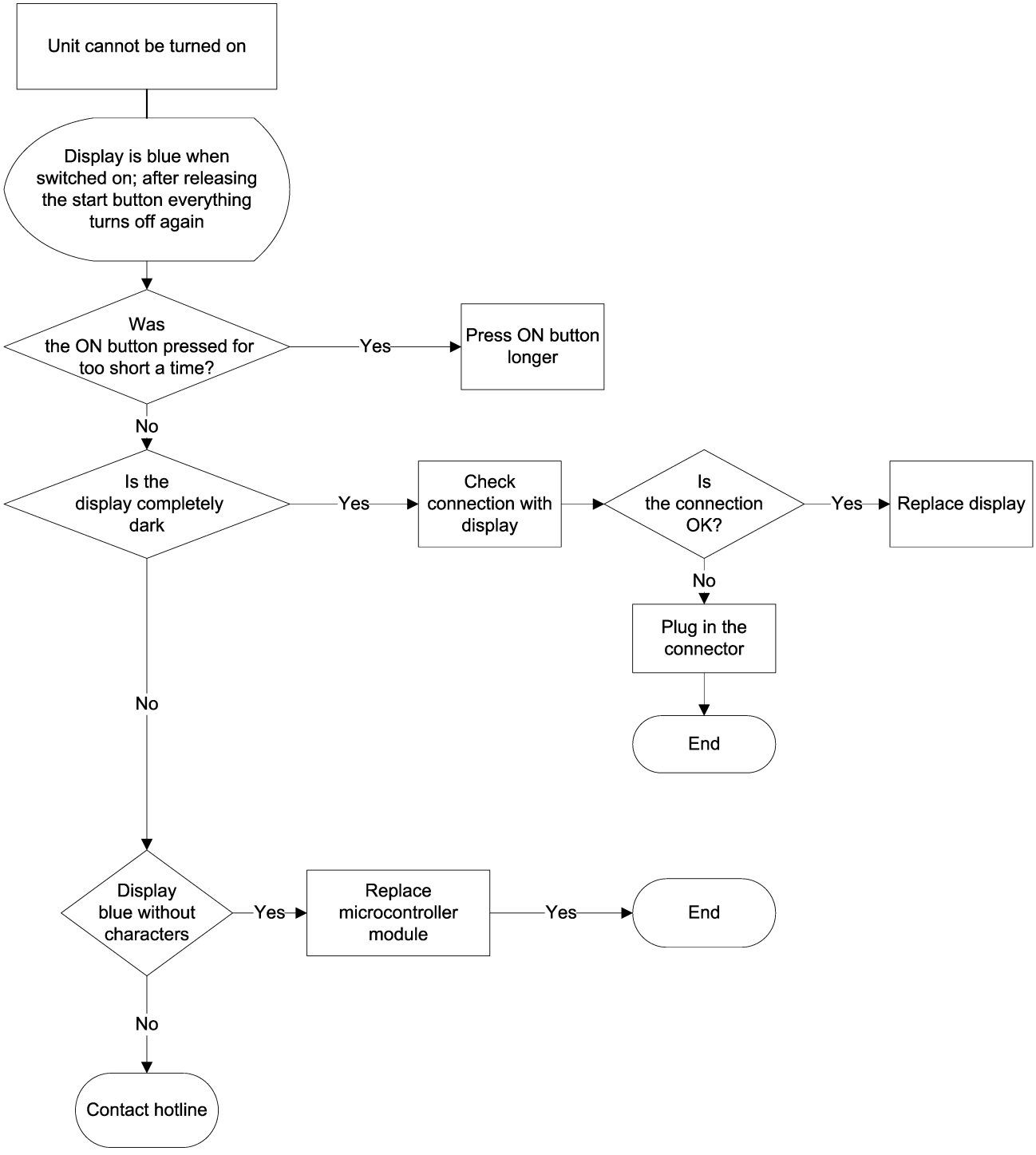


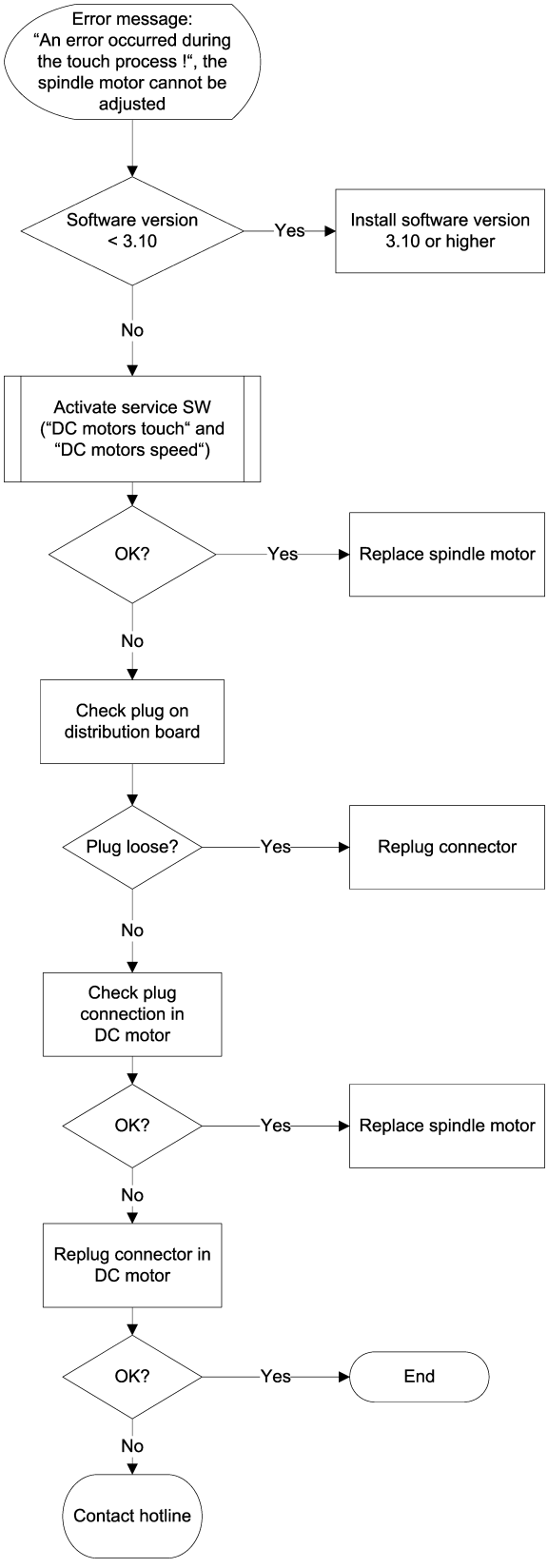
3.14 Unit cannot find starting position



3.15 Unit cannot be turned on



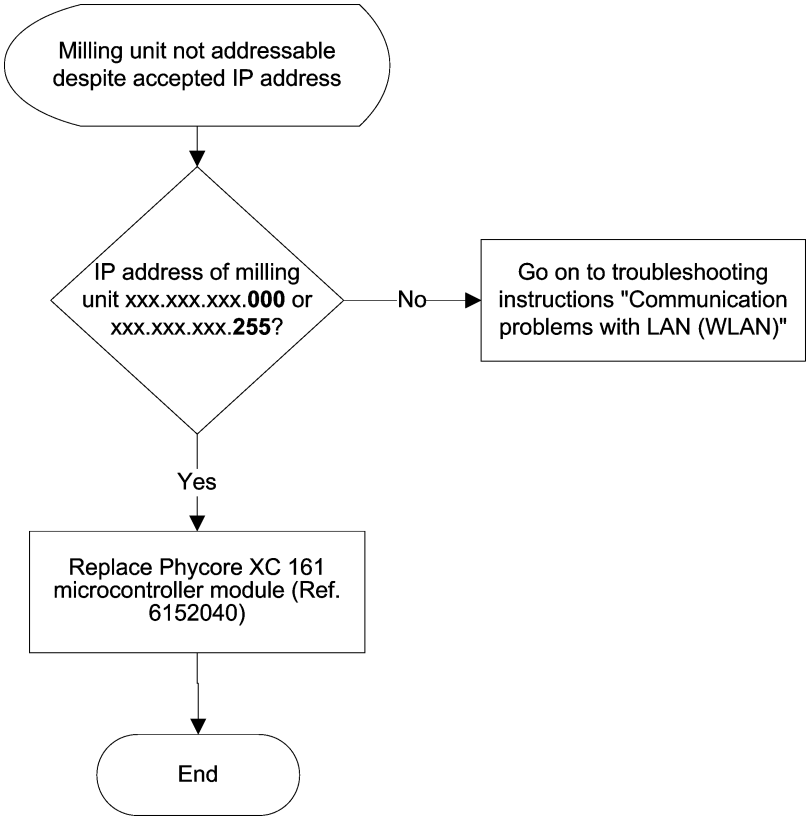
3.16 Touch errors



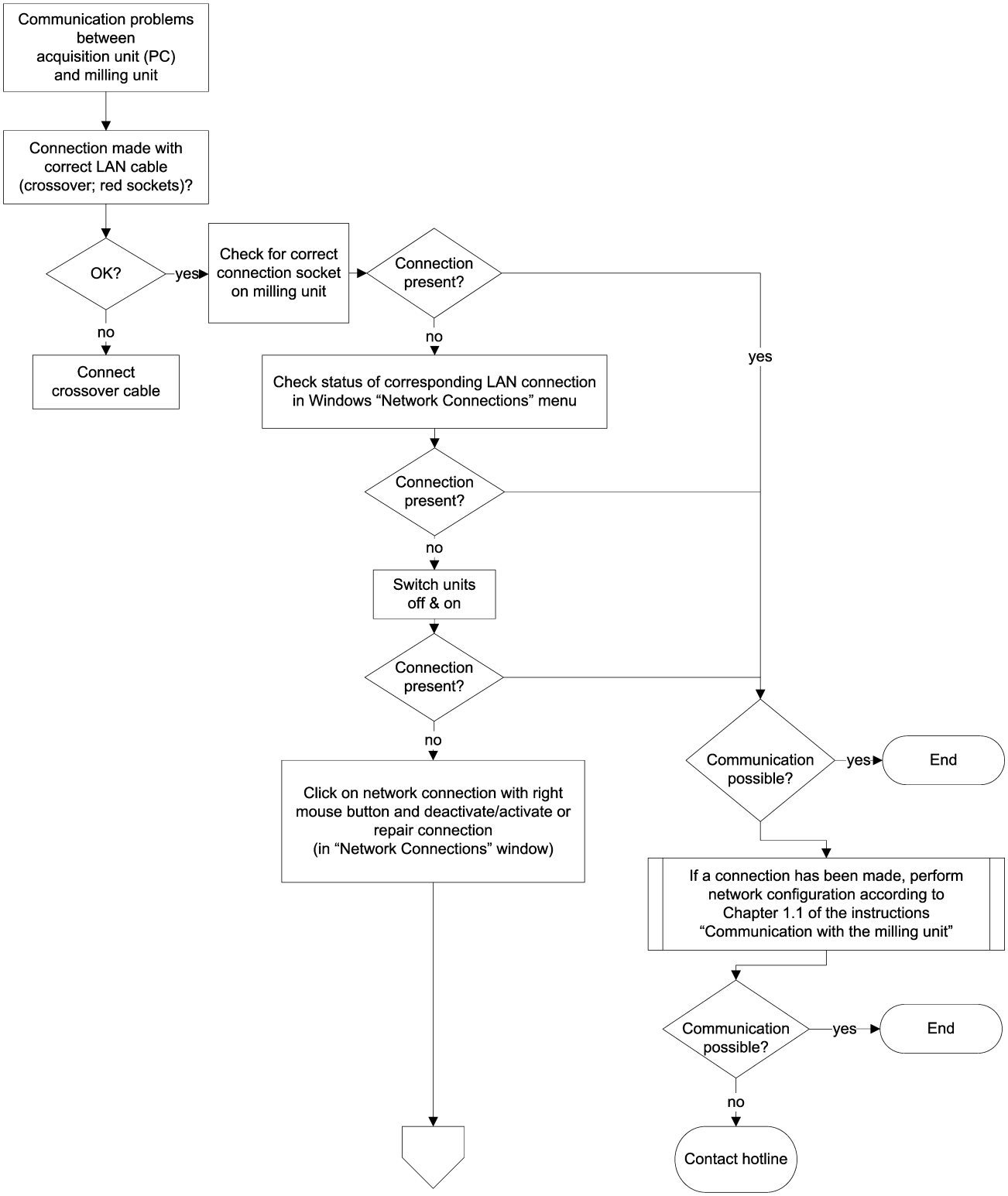
3.17 Service life of milling instruments too short

Service life of milling instruments too short
Check flow of 3 nozzles on both sides (check for sufficient water throughput!)
Blocked?
Yes
Unscrew and clean nozzle plate
No
Software version < 3.10?
Yes
Install software version 3.10 or higher
No
Calibrate the milling unit
Error message after calibration?
Yes
Replace spindle motor
No
No error message, but milling instruments still logged off?
Yes
Activate service software (DC motors touch, DC motors speed, constant load) and test DC motor
Remove DC motor and check for humidity
DC motor error during software test?
Yes
Replace DC motor, housing, seals, O-rings
No
Replace housing, seals, O-rings
No
Contact hotline

3.18 Milling unit not addressable


Milling unit not addressable despite accepted IP address
IP address of milling unit xxx.xxx.xxx.000 or xxx.xxx.xxx.255?
No
Go on to troubleshooting instructions "Communication problems with LAN (WLAN)"
Yes
Replace Phycore XC 161 microcontroller module (Ref. 6152040)
End

3.19 LAN communication problems


Communication problems between acquisition unit (PC) and milling unit
Connection made with correct LAN cable (crossover; red sockets)?
OK?
yes
no
Connect crossover cable
Check for correct connection socket on milling unit
Connection present?
no
yes
Check status of corresponding LAN connection in Windows “Network Connections” menu
Connection present?
no
Switch units off & on
Connection present?
no
Click on network connection with right mouse button and deactivate/activate or repair connection (in “Network Connections” window)
Communication possible?
yes
End
If a connection has been made, perform network configuration according to Chapter 1.1 of the instructions “Communication with the milling unit”
Communication possible?
yes
End
no
Contact hotline

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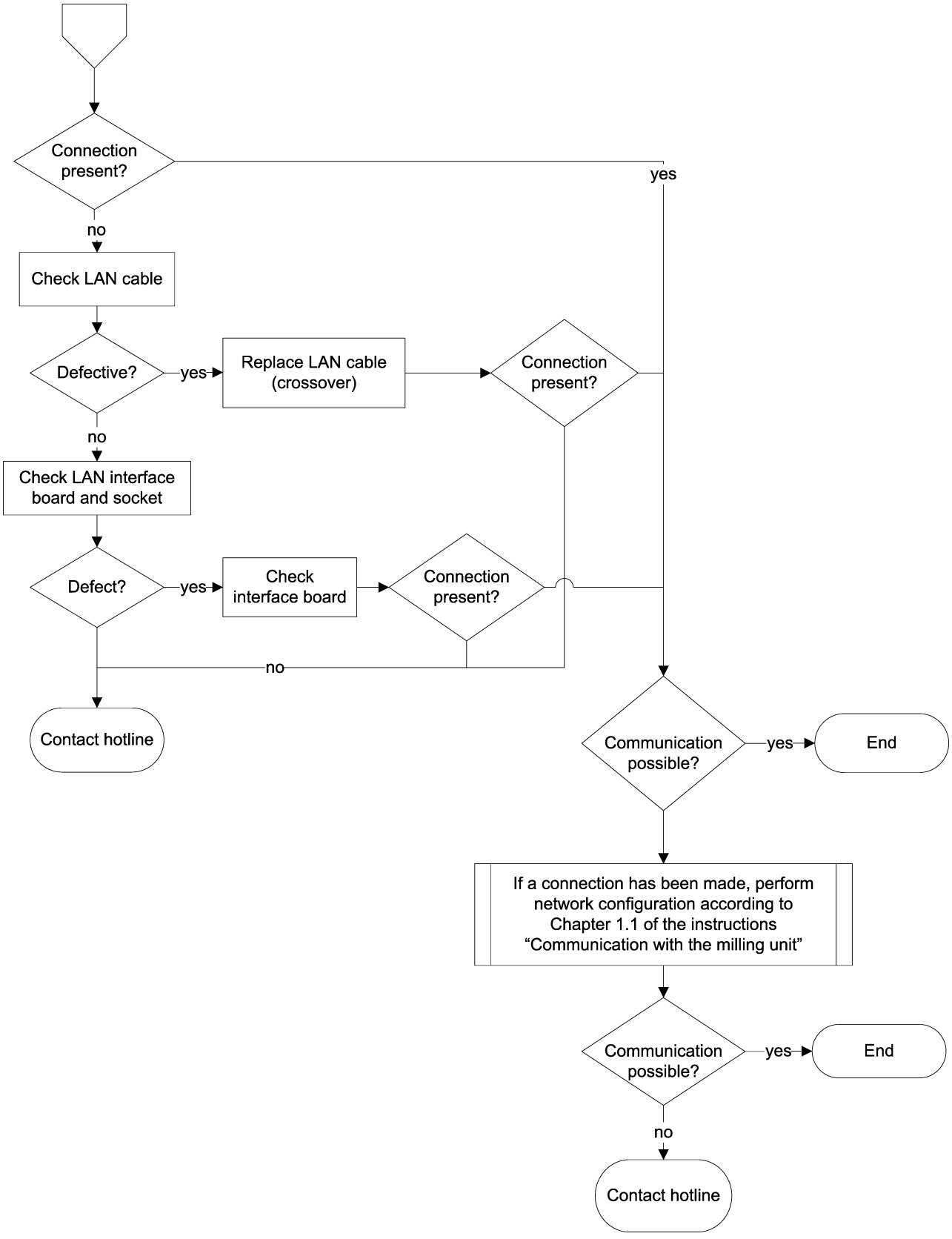
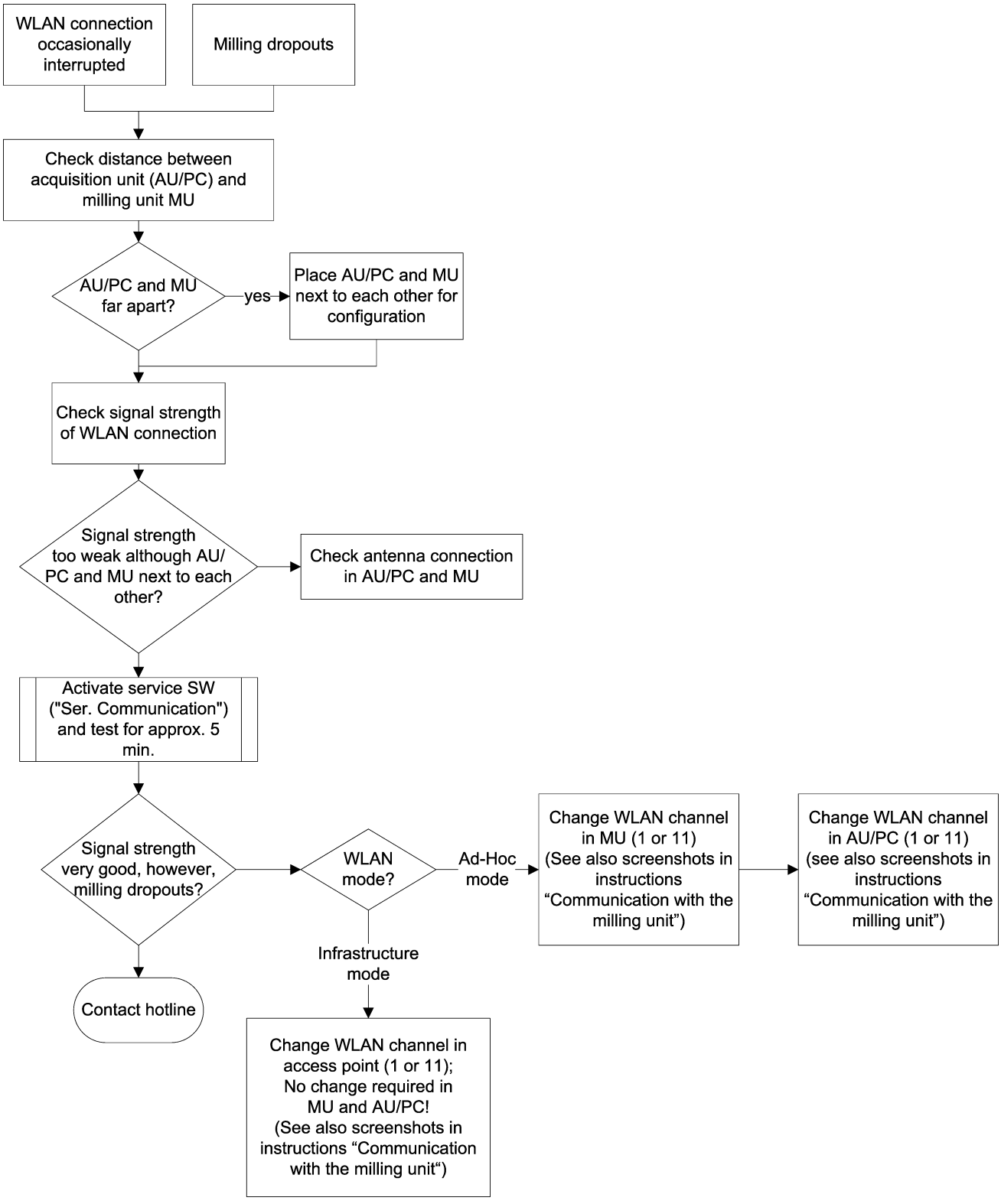
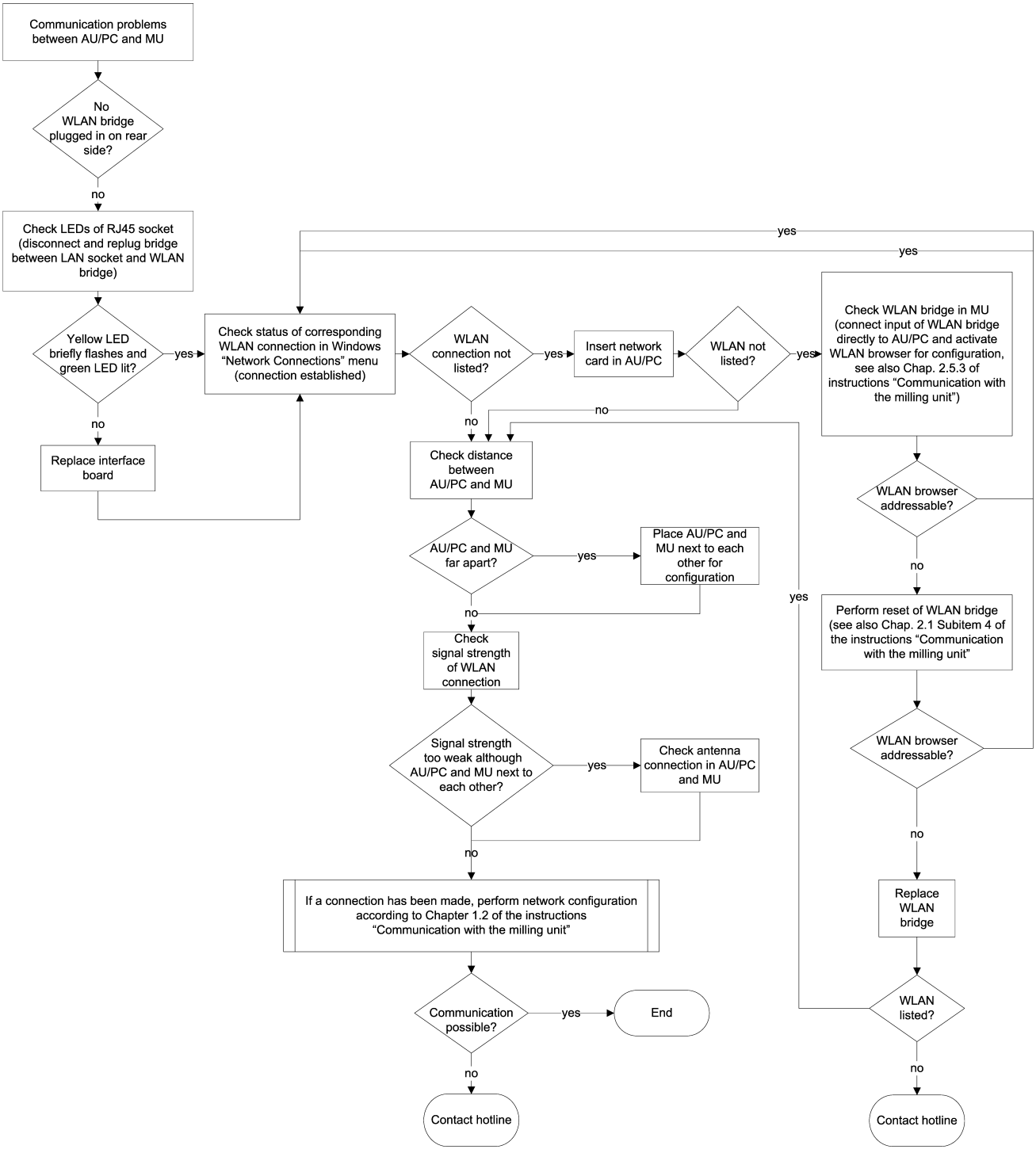


3.20 WLAN connection occasionally interrupted


WLAN connection occasionally interrupted
Milling dropouts
Check distance between acquisition unit (AU/PC) and milling unit MU
AU/PC and MU far apart?
yes
Place AU/PC and MU next to each other for configuration
Check signal strength of WLAN connection
Signal strength too weak although AU/PC and MU next to each other?
Check antenna connection in AU/PC and MU
Activate service SW ("Ser. Communication") and test for approx. 5 min.
Signal strength very good, however, milling dropouts?
WLAN mode?
Ad-Hoc mode
Change WLAN channel in MU (1 or 11) (See also screenshots in instructions “Communication with the milling unit”)
Change WLAN channel in AU/PC (1 or 11) (see also screenshots in instructions “Communication with the milling unit”)
Infrastructure mode
Contact hotline
Change WLAN channel in access point (1 or 11); No change required in MU and AU/PC! (See also screenshots in instructions “Communication with the milling unit“)

3.21 WLAN communication problems


Communication problems between AU/PC and MU
No WLAN bridge plugged in on rear side?
no
Check LEDs of RJ45 socket (disconnect and replug bridge between LAN socket and WLAN bridge)
Yellow LED briefly flashes and green LED lit?
yes
no
Replace interface board
Check status of corresponding WLAN connection in Windows "Network Connections" menu (connection established)
WLAN connection not listed?
yes
Insert network card in AU/PC
WLAN not listed?
yes
Check WLAN bridge in MU (connect input of WLAN bridge directly to AU/PC and activate WLAN browser for configuration, see also Chap. 2.5.3 of instructions "Communication with the milling unit")
yes
yes
no
no
Check distance between AU/PC and MU
AU/PC and MU far apart?
yes
Place AU/PC and MU next to each other for configuration
no
Check signal strength of WLAN connection
Signal strength too weak although AU/PC and MU next to each other?
yes
Check antenna connection in AU/PC and MU
no
If a connection has been made, perform network configuration according to Chapter 1.2 of the instructions "Communication with the milling unit"
Communication possible?
yes
End
no
Contact hotline
WLAN browser addressable?
no
Perform reset of WLAN bridge (see also Chap. 2.1 Subitem 4 of the instructions "Communication with the milling unit"
WLAN browser addressable?
yes
no
Replace WLAN bridge
WLAN listed?
yes
no
Contact hotline

sirona
The Dental Company

Repair

CEREC / inLab MC XL

4 Repair

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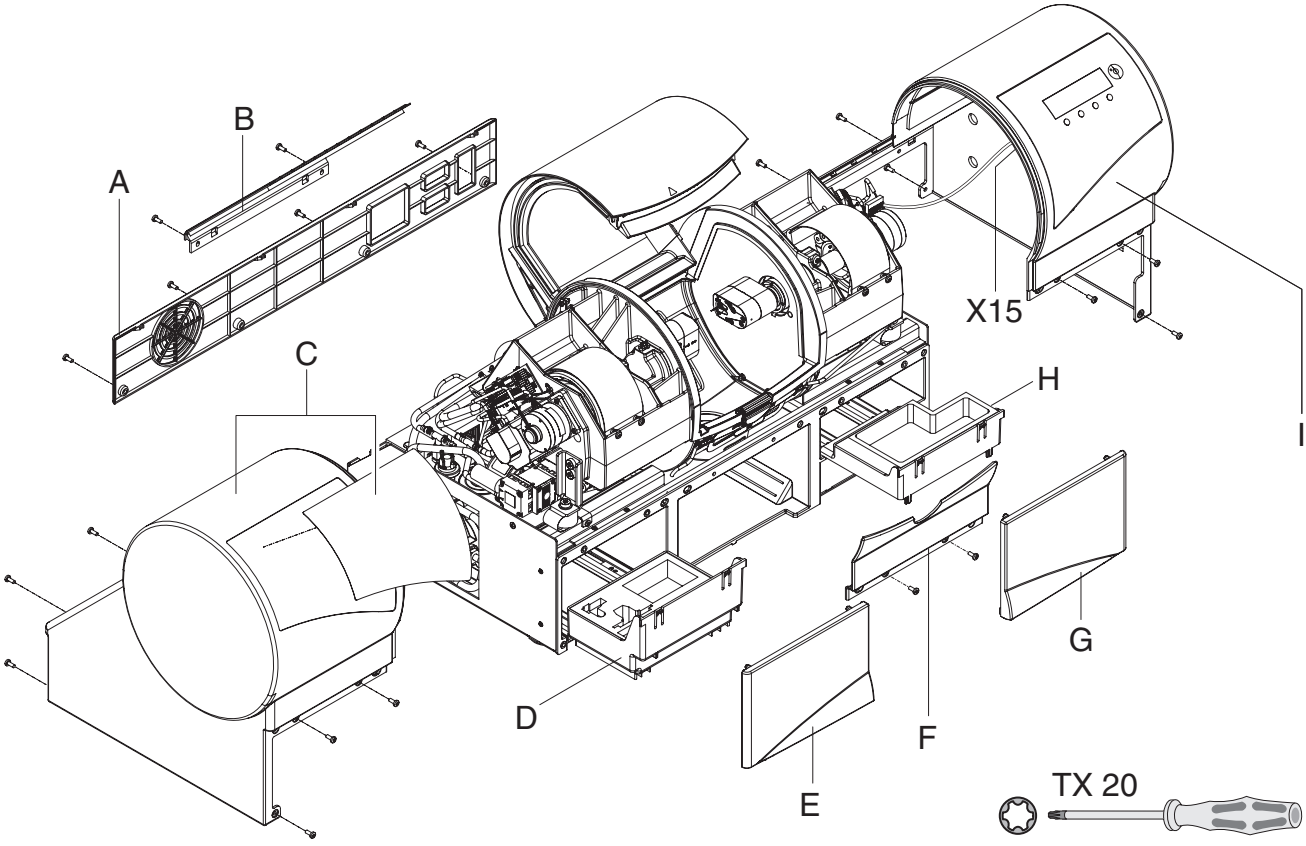
4.1 Removing/attaching covers

CAUTION:
All of the unit's housing covers must always be attached during milling and scanning operations.

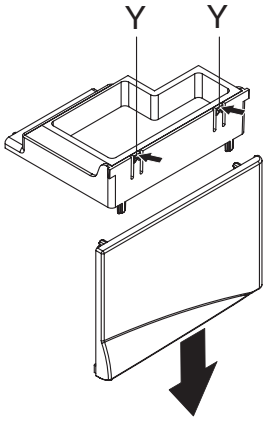


Covers

A	Cover, rear panel	F	Cover, front
B	Intermediate cover	G	Cover, right drawer
C	Cover, left	H	Drawer insert, right
D	Drawer insert, left	I	Cover, right
E	Cover, left drawer		

Removing the covers

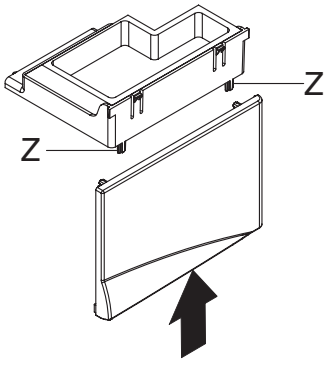
CAUTION: Conductor with connector X15 on cover, right
When removing:
Remove right cover(**I**) carefully and pull off connector **X15**.



1. Remove the covers in the following order:
   A -> F -> G* -> I -> B -> E* -> C
2. *To remove covers G and E, press the catches **(Y)** slightly toward the unit and pull the cover downward.

Attaching covers

CAUTION: Conductor with connector X15 on cover, right
When attaching:
Plug in connector**X15** and carefully slide on the right cover (**I**).

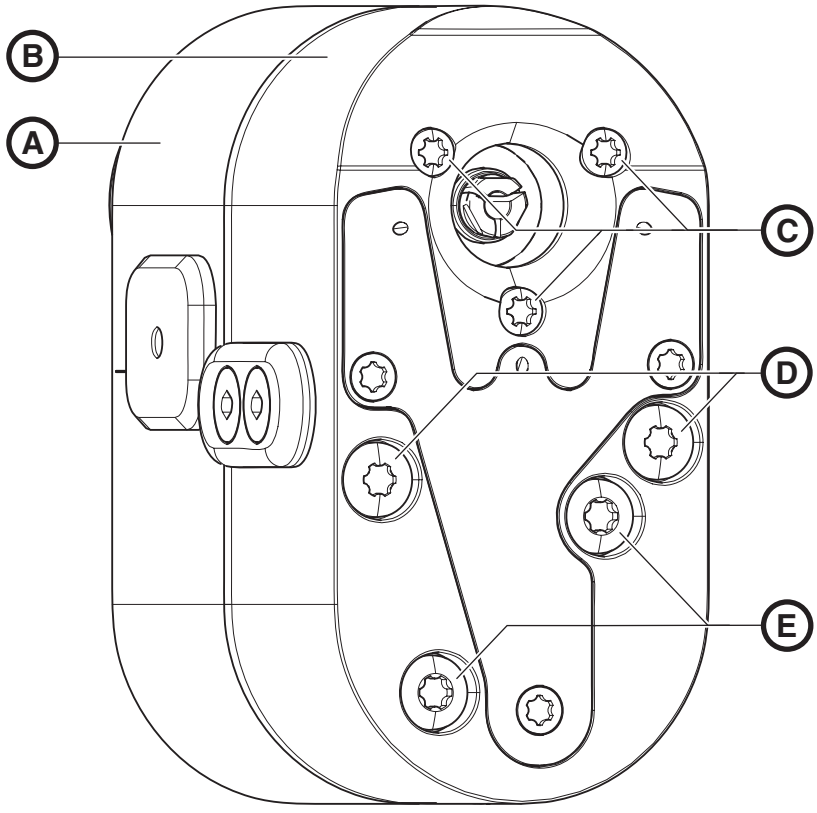


1. Attach the covers in the following order:
   C -> E* -> B -> I -> G* -> F -> A
2. * To attach covers G and E, insert guide pins **Z** in the cover and push the cover upward until it snaps into place.

NOTE: Make sure that the gap is even
When attaching the left and right covers, make sure that an even (i.e. uniform) gap results.

4.2 Replacing the (DC) spindle motors

4.2.1 DC motor, single



A	Mount cover	**D**	Fastening screws, motor mount/mount cover
B	Motor mount	**E**	Fastening screws, shaft
C	Fastening screws, motor		

4.2.1.1 Removal

Preparation

1. Switch the milling unit on.

   ↳ The motors move into the home position.

2. Switch the milling unit off at the main switch (**0**).
3. Open the milling chamber door.

If a scanner is present

➢ Remove the scanner, see "Unscrewing the scanner" [🗎 86].

Removing the motor unit

1. Remove the fastening screws of the mount cover.
2. Remove the fastening screws of the shaft.
3. Pull the motor mount together with the motor off of the shaft and the mount cover. At the same time, unplug the power supply connectors.

If a scanner is present

➢ Disconnect the scanner connectors.

Removing the motor

1. Remove the fastening screws of the motor.
2. Pull the motor out of the motor mount.
3. If necessary, pull the plug connector strip out of the motor/scanner socket and connect it to the socket in the milling unit.

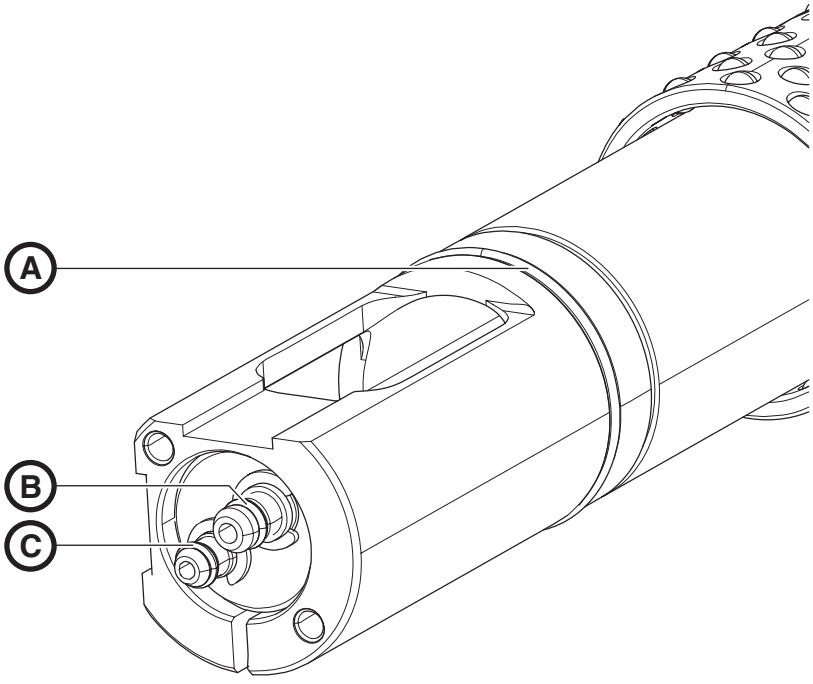
Replacing the O-rings

NOTE: O-rings
Use the O-rings supplied with the unit.

1. Pull the mount cover off of the shaft.

CAUTION: Do not damage the cables
When removing the mount cover, be careful not to damage any electrical connecting cables. Place the sockets in the shaft.

2. Pull the front O-ring off of the shaft and replace it with a new one.
3. Pull the O-rings off of the air connector (light blue) and the water connector (blue) and replace them with new ones.

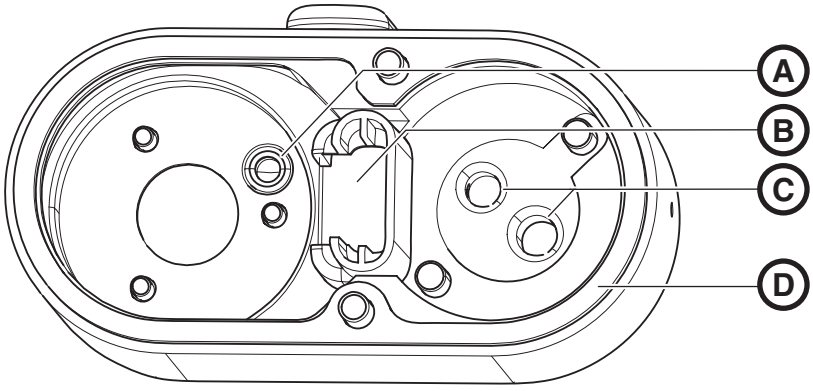


A O-ring, shaft
B Water connector
C Air connector

4.2.1.2 Installation

NOTE: Use the spare parts supplied
Use the O-rings, screws and seals supplied with the unit.

Attaching the motor to the motor mount



A	O-ring in the motor mount	**C**	Holes for air and water connections
B	Power cable guide	**D**	Mount cover gasket

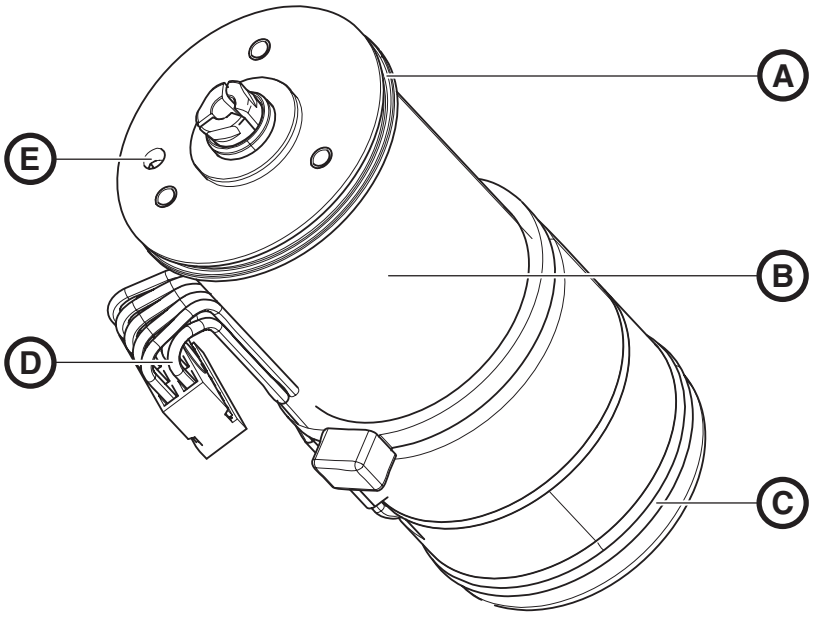
✓ The first O-ring on the shaft and the O-rings of the air (light blue) and water (blue) connections have been replaced.

✓ The upgrade kit has been installed and is complete.

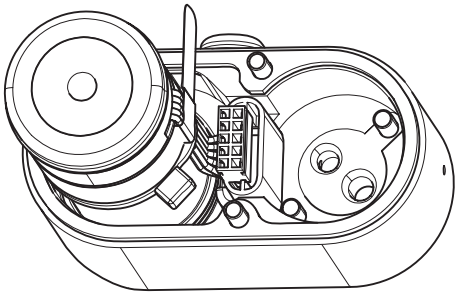
1. If the mount cover gasket **D** has become loose: Remove all adhesive residue and adhere a new gasket to the mount cover.
2. Replace the O-ring in the motor mount **A**. Apply a small amount of lubricant to the O-ring prior to installation and make sure that it does not slip.

NOTE:
Hold the motor mount in a horizontal position to prevent the O-ring in the motor mount **A** from slipping.

3. Fold the cables of the DC motor down so that the red dot points toward the motor.



A	Motor O-ring	**D**	Power supply cable
B	Spindle motor	**E**	Hole for air connection
C	Bulge		



4. Grease motor O-ring of the motor **A** and the bulge **C** sparingly.
5. Place the motor **B** in the motor mount.
   The hole for the air connection **E** must lie on the O-ring in the motor mount.
6. Insert the power supply cable **D** in the motor mount guide provided for this purpose.
7. Apply a light coat of the Loctite sealer included in the scope of supply to the threads of the motor fastening screws

NOTE:
Press the motor slightly from the rear until you have securely screwed it onto the motor mount. This prevents the O-ring from slipping.

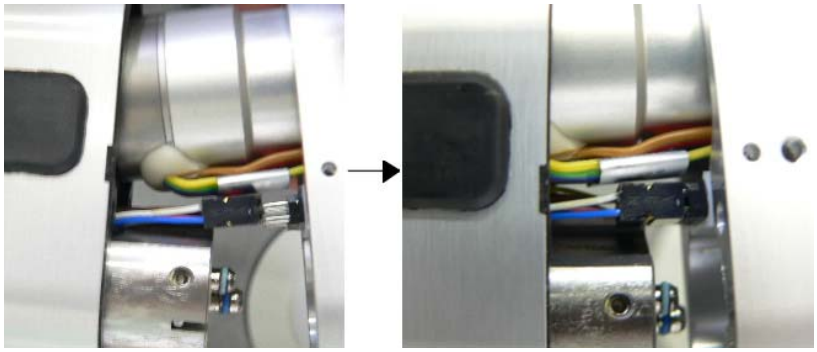
8. Turn the motor so that the holes of the motor mount line up with the holes of the motor.
9. Screw the motor mount and motor together.

Installing the motor in the unit

1. Push the mount cover onto the shaft as far as it will go.

CAUTION: Do not damage the cables
Be careful not to damage any electrical cables when pushing the mount cover onto the shaft. Place the socket in the shaft.

2. Push the motor along with the motor mount onto the shaft.



NOTE: Proper connection of the power supply

Make sure to connect the socket for the power supply of the DC motor to the cable for Bur Set 1. The socket for Bur Set 1 is labeled with a red dot.

The red dots on the connectors must be on the same side when connected.

3. Connect the power supply connectors.

If a scanner is present

➢ Connect the scanner connectors.

Installing the motor unit

1. Push the motor mount onto the shaft until it locks in place.
2. Push the mount cover onto the motor mount as far as it will go.

   ↳ A gap remains between the mount cover and the motor mount.
3. Apply a light coat of the Loctite sealer included in the scope of supply to the threads of the shaft fastening screws.
4. Screw the motor mount onto the shaft; do not tighten the screws fully when doing this.
5. Screw the motor mount and mount cover together.

   ↳ The gap closes.
6. Set the torque wrench to 1.1 Nm and screw the shaft fastening screws tight with the torque wrench.
7. Tighten the fastening screws of the motor mount/mount cover securely.

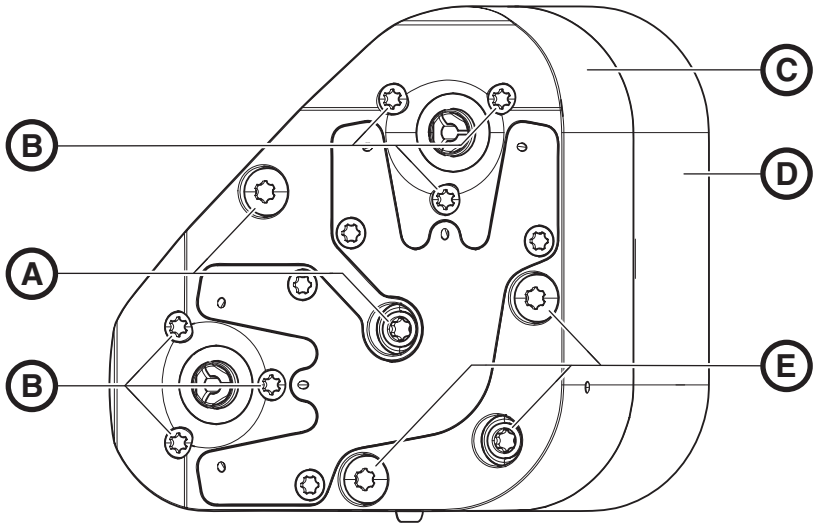
If a scanner is present

➢ Install the scanner, see "Screwing on the scanner" [🗎 87].

Tests and settings

See "Testing and setting the DC motor(s)" [🗎 84]

4.2.2 DC motor, double



A	Fastening screws, shaft	**D**	Mount cover
B	Fastening screws, motor	**E**	Fastening screws, motor mount/mount cover
C	Motor mount		

4.2.2.1 Removal

Preparation

1. Check which spindle motor must be replaced.
2. Switch the milling unit on.

   ↳ The motors move into the home position.
3. Switch the milling unit off at the main switch (**0**).
4. Open the milling chamber door.

If a scanner is present

➢ Remove the scanner, see "Unscrewing the scanner" [🗎 86].

Removing the motor unit

1. Remove the fastening screws of the mount cover.
2. Remove the fastening screws of the shaft.
3. Pull the motor mount together with the motor off of the shaft and the mount cover. At the same time, unplug the power supply connectors.

If a scanner is present

➢ Disconnect the scanner connectors.

Removing the motor

1. Remove the fastening screws of the motor being replaced.
2. Pull this motor out of the motor mount.
3. If necessary, pull the connector strip out of the motor/scanner sockets and connect it to the sockets in the milling unit.

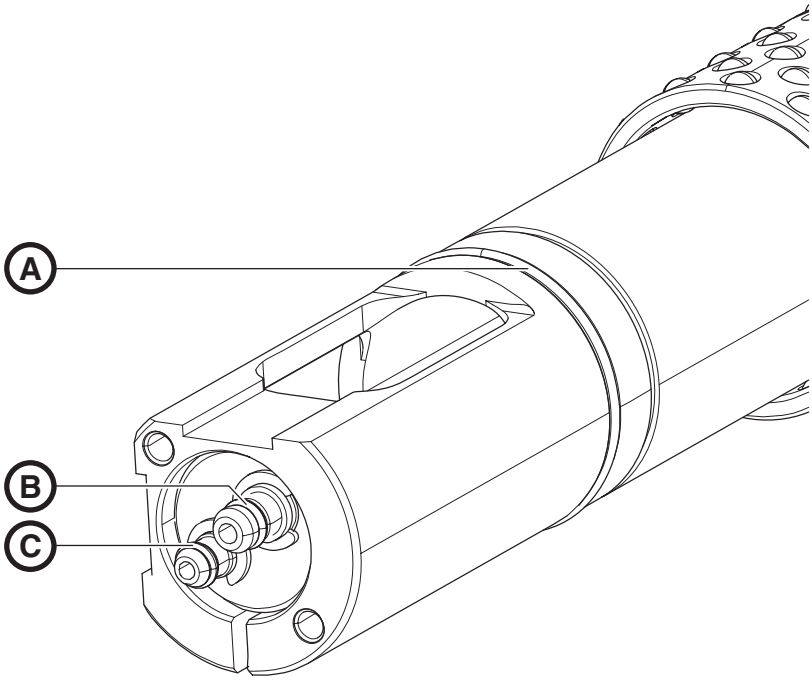
Replacing the O-rings

NOTE: O-rings
Use the O-rings supplied with the unit.

1. Pull the mount cover off of the shaft.

⚠CAUTION: Do not damage the cables
When removing the mount cover, be careful not to damage any electrical connecting cables. Place the sockets in the shaft.

2. Pull the front O-ring off of the shaft and replace it with a new one.
3. Pull the O-rings off of the air connector (light blue) and the water connector (blue) and replace them with new ones.

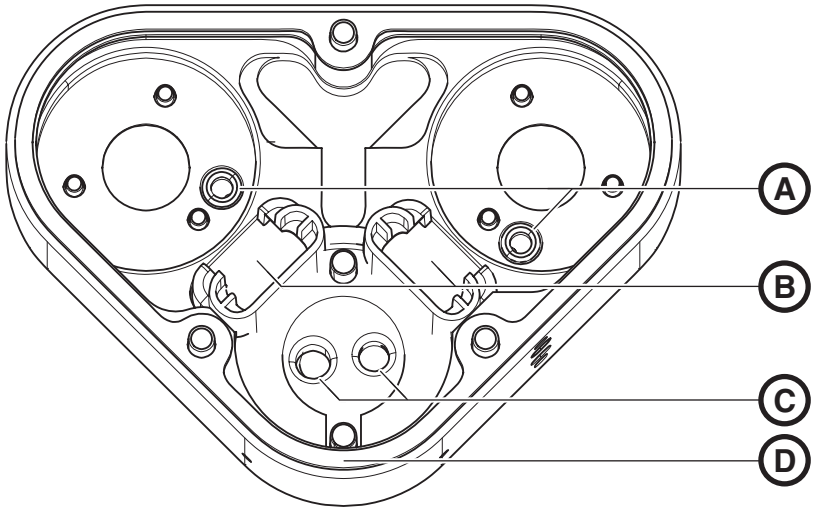


A O-ring, shaft
B Water connector
C Air connector

4.2.2.2 Installation

NOTE: Use the spare parts supplied
Use the O-rings, screws and seals supplied with the unit.

Attaching the motor to the motor mount



A	O-ring	**C**	Holes for air and water connections
B	Power cable guide	**D**	Mount cover gasket

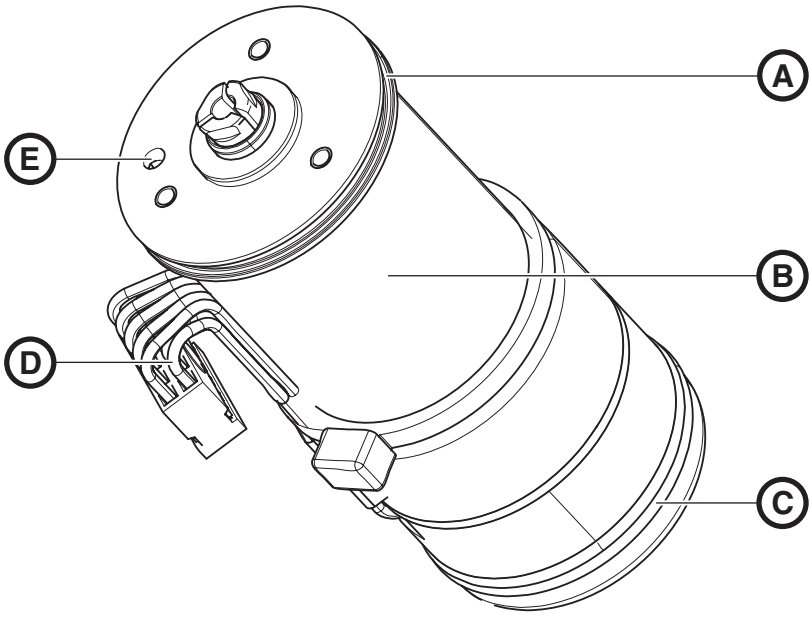
✓ The first O-ring on the shaft and the O-rings of the air (light blue) and water (blue) connections have been replaced.

✓ The upgrade kit has been installed and is complete.

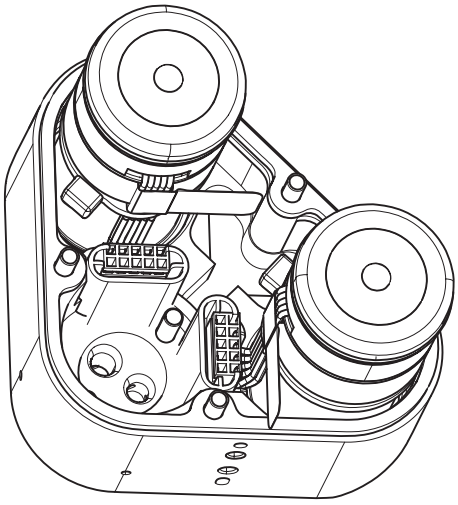
1. If the mount cover gasket **D** has become loose: Remove all adhesive residue and adhere a new gasket to the mount cover.
2. Replace the O-ring in the motor mount **A**. Apply a small amount of lubricant to the O-ring prior to installation and make sure that it does not slip.

NOTE:
Hold the motor mount in a horizontal position to prevent the O-ring in the motor mount **A** from slipping.

3. Fold the cables of the DC motor down so that the red dot points toward the motor.



A	Motor O-ring	**D**	Power supply cable
B	Spindle motor	**E**	Hole for air connection
C	Bulge		



Installing the motors in the unit

4. Grease motor O-ring of the motor **A** and the bulge **C** sparingly.
5. Place the motor **B** in the motor mount.
   The hole for the air connection **E** must lie on the O-ring in the motor mount.
6. Insert the power supply cable **D** in the motor mount guide provided for this purpose.
7. Apply a light coat of the Loctite sealer included in the scope of supply to the threads of the motor fastening screws

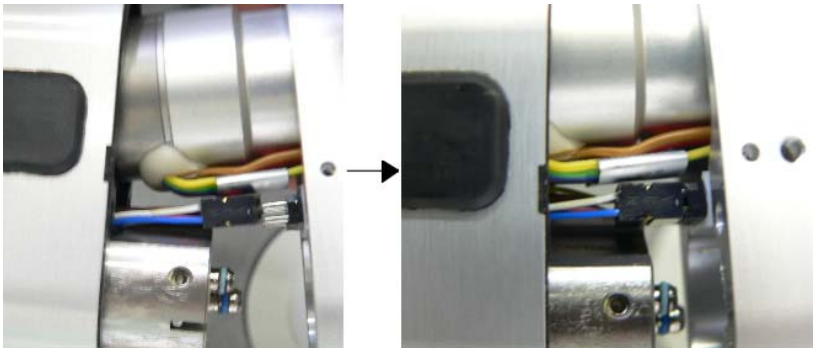
NOTE:
Press the motor slightly from the rear until you have securely screwed it onto the motor mount. This prevents the O-ring from slipping.

8. Turn the motor so that the holes of the motor mount line up with the holes of the motor.
9. Screw the motor mount and motor together.

1. Push the mount cover onto the shaft as far as it will go.

NOTE: Do not damage the cables
Be careful not to damage any electrical connecting cables when pushing the mount cover onto the shaft. Place the sockets in the shaft for this purpose.

2. Push the motors along with the motor mount onto the shaft.

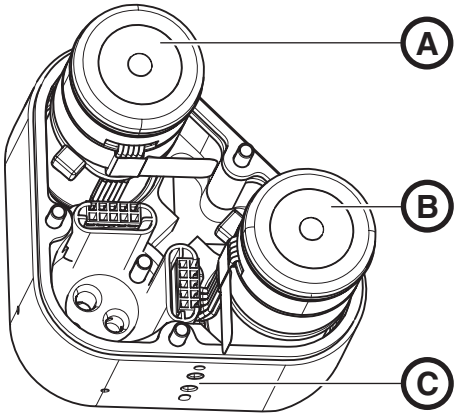


3. Connect the power supply connectors (e.g. using a pair of tweezers).

NOTE: Proper connection of the power supply

Take care not to confuse the power supply cables for the two DC motors. The cable for Bur Set 1 is labeled with a red dot on the socket, while the cable for Bur Set 2 has a blue dot. The DC motor that is installed on the scanner side must be connected to the cable for Bur Set 1.

The colored dots on the sockets must be on the same side when connected.



A Bur Set 2

B Bur Set 1

C Scanner attachment

If a scanner is present

➢ Connect the scanner connectors.

Installing the motor unit

1. Push the motor mount onto the shaft until it locks in place.
2. Push the mount cover onto the motor mount as far as it will go.
   ↳ A gap remains between the mount cover and the motor mount.
3. Apply a light coat of the Loctite sealer included in the scope of supply to the threads of the shaft fastening screws.
4. Screw the motor mount onto the shaft; do not tighten the screws fully when doing this.
5. Screw the motor mount and mount cover together.
   ↳ The gap closes.
6. Set the torque wrench to 1.1 Nm and screw the shaft fastening screws tight with the torque wrench.
7. Tighten the fastening screws of the motor mount/mount cover securely.

If a scanner is present

➢ Install the scanner, see "Screwing on the scanner" [🗎 87].

Tests and settings

See "Testing and setting the DC motor(s)" [🗎 84]

4.2.3 Testing and setting the DC motor(s)

Following the replacement of the DC motor(s), the following checks and settings have to be performed:

Checking DC motor(s) with service software

NOTE: Selecting the motor set
Make sure to select the right motor set for checking the DC motor before starting the corresponding test.

1. Perform the "Media Supply" test.
   ↳ Air noticeably escapes from every DC motor.
2. Perform the "DC Motor Start/Warmup" test.
   ↳ The motor starts up or the motors warm up for at least 2 minutes.
3. Perform the "DC Motor Touch" test.
4. Perform the "DC Motor Speed" test.
5. Perform the "Power Sensor" test.

For further information about these tests please refer to the service manual.

Adjusting the plunger pin

Adjust the plunger pin as described in the repair instructions or the service manual.

Calibrate the milling unit

Calibrate the milling unit (and Bur Set 2, if present) as described in the operator manual.

Remove the calibration pin and the calibration block. Return them to the appropriate system drawer.

If a scanner is present

➢ Test the scanner and calibrate it as described in "Testing and setting the scanner" [88].

Performing a milling test with Bur Set 1

✓ `"Bur Set 1"` has the following inserts: `"Step Bur 12"` and `"Cyl. Pointed Bur 12"`.

1. Load a test block:
   `Test`, `Patient` -> `Pyramid`.
2. Insert a CEREC Block I10.
3. Mill the pyramid test block and measure it.
   ↳ The edge length must equal 4.90mm to 5.03mm. The difference between the edge lengths must be less than 0.05mm; the height of the pyramid must equal 5.20 to 5.35mm.

Performing a milling test with Bur Set 2 (if present)

The milling unit prioritizes `"Bur Set 1"`. In order to mill the pyramid test block with `"Bur Set 2"` in the milling unit, set the software settings for `"Bur Set 1"` to long milling instruments (`"Step Bur 20"` and `"Cyl. Pointed Bur 20"`).

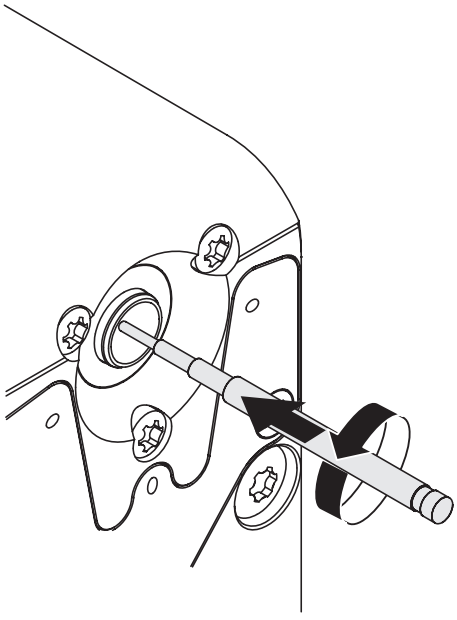
✓ `"Bur Set 2"` has the following inserts: `"Step Bur 12"` and `"Cyl. Pointed Bur 12"`.

1. Set long milling instruments (`"Step Bur 20"` and `"Cyl. Pointed Bur 20"`) in the software for `"Bur Set 1"`.
2. Insert a CEREC Block I10.
3. Repeat the milling of the pyramid test block with `"Bur Set 2"`.

4. Measure the test block (see the dimensions given in section "Performing a milling test with Bur Set 1").
5. Reset the system to the right milling instruments for "`Bur Set 1`".

NOTE: Settings of milling instruments
Milling results will be faulty if the settings of the milling instruments in the software do not match the milling instruments currently inserted into the corresponding milling set.

4.2.4 Chuck of milling instrument broken



✓ Sometimes the chuck may break off in the area of the thread and the broken part may then remain in the hollow shaft of the DC motor.

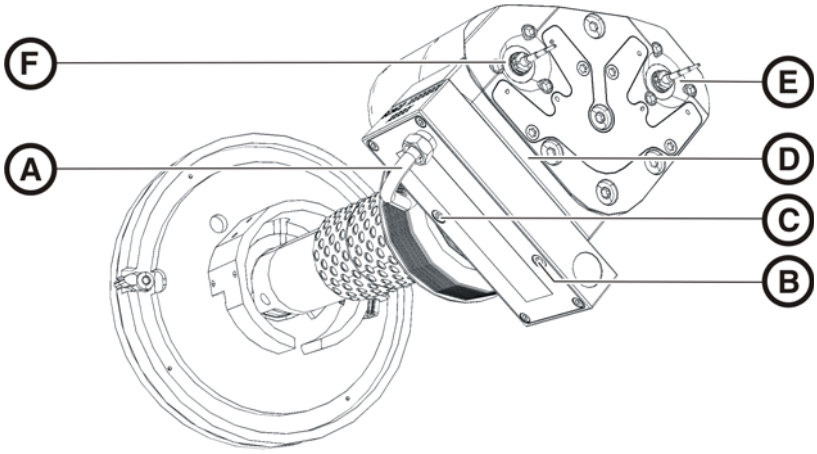
➢ Use a milling instrument, i.e. Step Bur 12 or Step Bur 20, to pull/screw the broken chuck out of the hollow shaft.

4.3 Replacing/retrofitting the scanner

Preparation

1. Switch the milling unit off at the main switch (**0**).
2. Open the milling chamber door.

Survey of parts based on double DC motor



A	Cable	**D**	Sensor mounting plate
B	Torx screw, long	**E**	Bur Set 2
C	Torx screw, short	**F**	Bur Set 1

4.3.1 Removal

4.3.1.1 Removal for replacement

Unscrewing the scanner

1. Remove both Torx screws from the scanner.
2. Carefully pull the scanner off of the sensor mounting plate and let it hang to one side from the cable.

ATTENTION: Do not damage the cables
Do not damage the cable when pulling off the scanner!

3. Remove both Torx screws from the sensor mounting plate.
4. Pull off the sensor mounting plate.

Removing mount cover with scanner

1. Remove the motor unit, see "Removing the motor unit" in chapter "DC motor, single (double)".
2. Disconnect the scanner connectors.
3. Pull the mount cover with the scanner off of the shaft.
4. Replace the O-rings, see "Replacing the O-rings" in chapter "DC motor, single (double)".

4.3.1.2 Removal for retrofitting

1. Remove the motor unit, see "Removing the motor unit" in the chapter "DC motor, single (double)".
2. Pull the mount cover off of the shaft.

3. Replace the O-rings, see "Replacing the O-rings" in the chapter "DC motor, single (double)".

4.3.2 Installation

NOTE: Supplied screws
Use the screws supplied with the unit.

Installing mount cover with scanner

Mount cover with scanner; above: single, below: double

CAUTION: Do not damage the cables
Do not damage the cable when pushing the mount cover on!

1. Push the mount cover with scanner onto the shaft and let the scanner hang from the cable laterally.
2. Connect the scanner connectors.
3. Install the motor unit, see "Installing the motor unit" in chapter "DC motor, single (double)".

Screwing on the scanner

1. Place the sensor mounting plate on the motor mount so that the beveled sides lie on top of each other.
2. Fasten the sensor mounting plate securely with two Torx screws.
3. Push the scanner onto the pins of the sensor mounting plate.

NOTE: Different screws for the scanner
The two Torx screws for the scanner vary in length. The shorter screw is used at the top left and the longer one is used at the bottom right (see illustration).

4. Screw the scanner onto the sensor mounting plate.

4.3.3 Testing and setting the scanner

Following the replacement or retrofitting of the DC motor(s) or the scanner, the scanner must be tested and calibrated.

Testing the scanner function with the service software

Perform the "Sensor" test as described in the service manual.

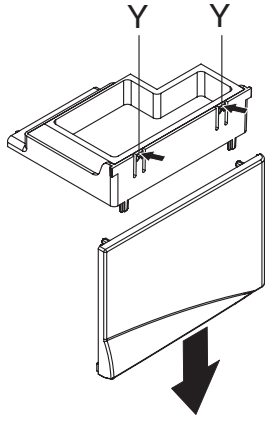
Calibrating the scanner

Calibrate the scanner as described in the operator manual.

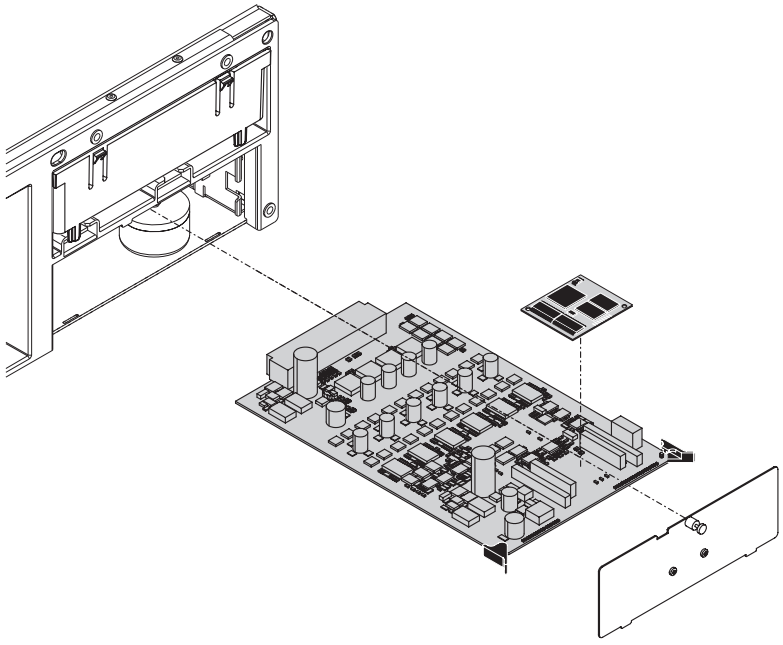
4.4 Replacing the controller board / microcontroller module

Removing the controller board

1. Pull out the drawer on the right.



2. Press the catches **(Y)** slightly toward the unit and pull the cover downward.
3. Reinsert the drawer.



Removing the board

4. Loosen the knurled screw and remove the metal cover.
5. Fold the two black clips outwards and pull out the controller board.

Replacing the controller board

1. Pull off the microcontroller module.
2. Plug the microcontroller module into the new controller board.

Replacing the microcontroller module

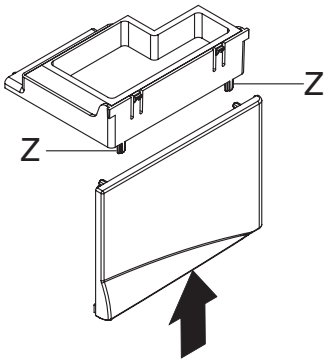
1. Pull off the defective microcontroller module.

⚠CAUTION: The unit must be recalibrated
Following replacement of the microcontroller module, the device must be recalibrated (see the chapter "Calibrating the unit" in the operating instructions).

2. Plug the new microcontroller module into the controller board.
3. After installing the controller board, perform the settings as described in the subchapter "Settings after replacing the microcontroller module".

Installing the controller board

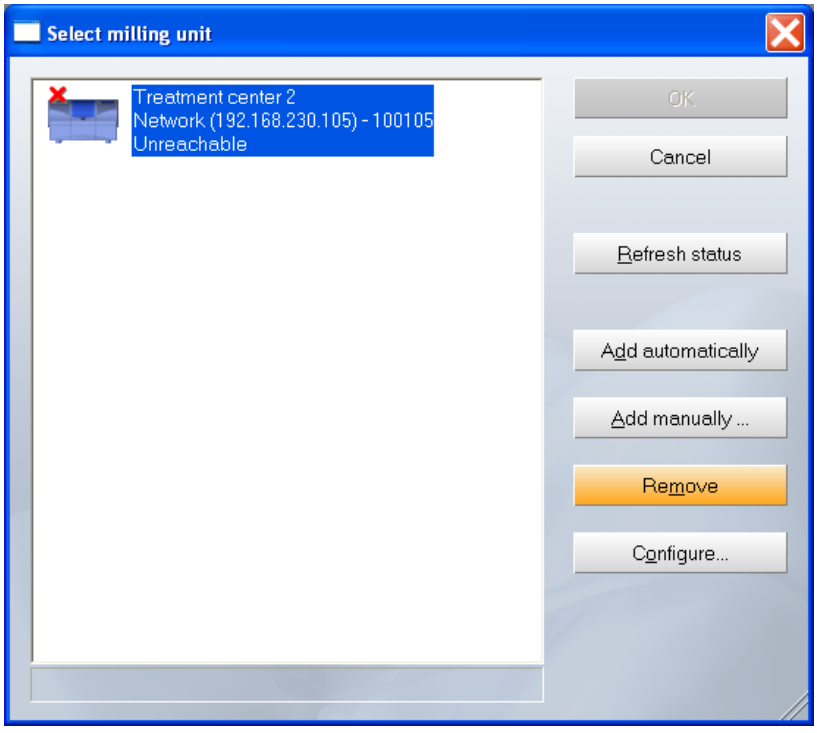
1. Insert the controller board in the rails and fold the two black clips inwards.
2. Screw the metal cover on tight with the knurled screw.



3. Insert guide pins **Z** in the cover and push the cover upward until it snaps into place.
4. Reinsert the drawer.

Settings after replacing the microcontroller module

1. Start the user software (CEREC 3D / inLab 3D).
2. Select the menu item "Settings" / "Configuration" / "Devices...".



Configuring devices

3. Note the device name and IP address of the milling unit where you replaced the microcontroller module.
4. Select the milling unit in the "Add Device" window and click the "Remove" button.
5. Switch the milling unit on.
6. Click the "Add manually" button.

   ↳ The "Add Device" dialog box opens.

7. Change the "Interface" setting to "Network".
8. Enter the following IP address in the "Host" field: **192.168.230.10**.
9. Confirm with the "OK" button.

   ↳ A download of the current software to the milling unit then follows.
10. Select the milling unit which was added and click the "Configure" button.
11. Enter the device name ("Description") and the IP address you noted previously and save these settings.

NOTE: Additional Documents
You will find more information on network configuration in the following documents:
„Operating the MC XL via LAN (61 90 503)“.
„Operating MC XL via WLAN in the Ad-hoc mode (61 90 545)“
„Operating MC XL via WLAN in infrastructure mode, Restoring default settings (61 90 560)“

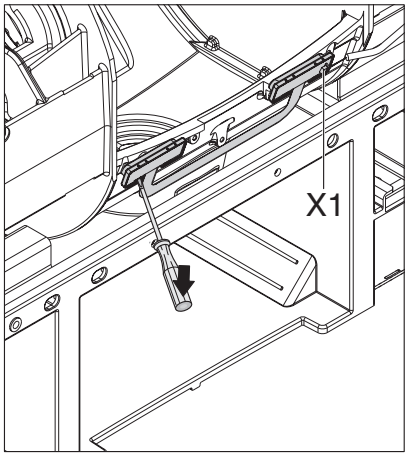
12. Calibrate the unit (see the chapter on "Calibrating the unit" in the operating instructions).

4.5 Replacing the WLAN module

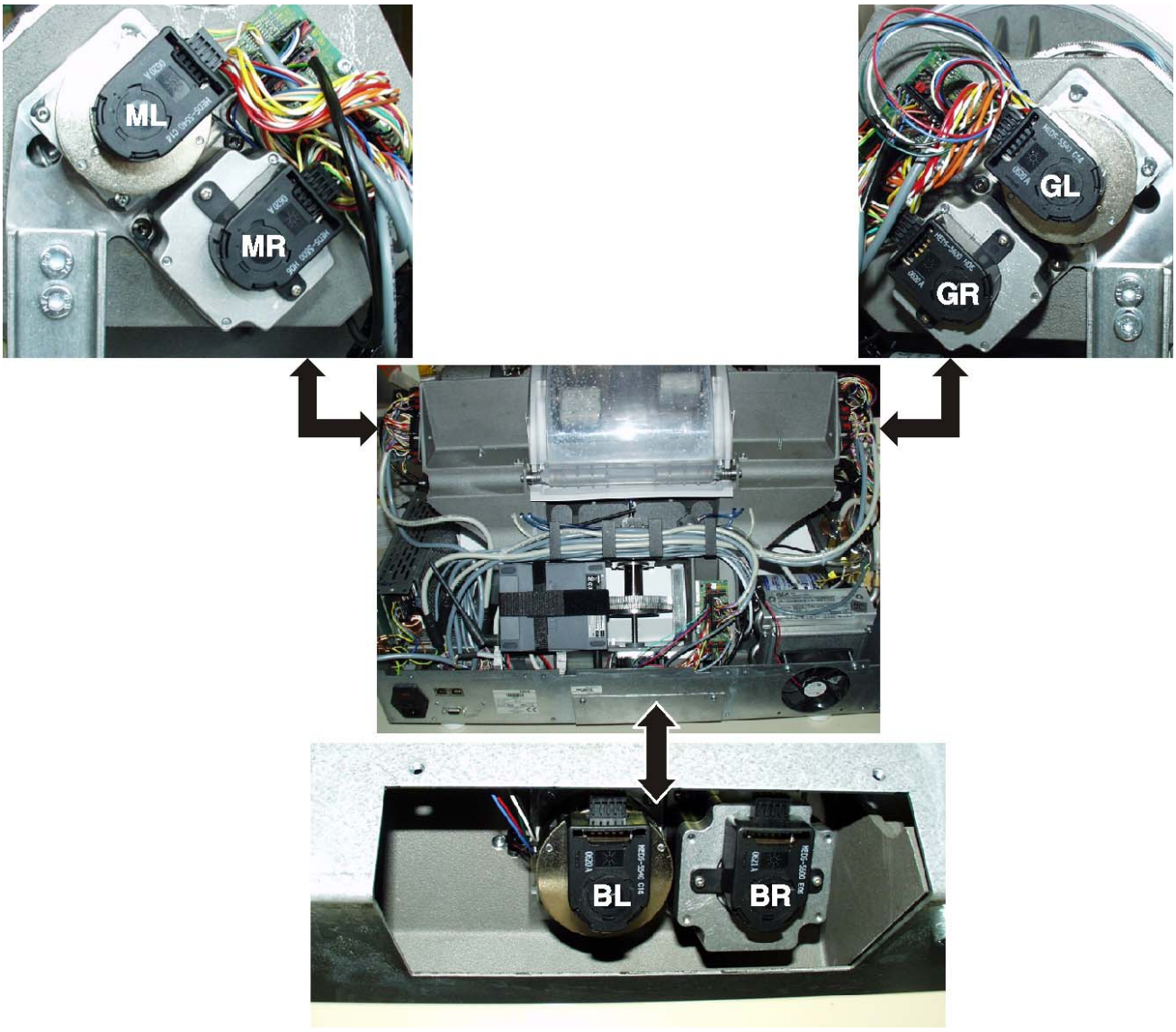
1. Remove all covers except for the left cover and the cover of the left drawer.
2. Pull the WLAN module off toward the rear.
3. Disconnect the power supply cable and the network cable of the WLAN module.
4. Install and configure the new WLAN module as described in the instructions supplied.

4.6 Replacing the milling chamber lighting

1. Open the milling chamber door.
2. Pull out the tank.
3. Unscrew the front cover.
4. Unscrew the key mount (5 screws).
5. Use a small screwdriver to pry out the milling chamber lighting PC board on both sides.
6. Pull off connector **X1**.
7. Plug connector **X1** into the new PC board.
8. Insert the new PC board on both sides until it locks into place.
9. Fasten the key mount tight using the 5 screws you removed earlier.
10. Screw on the front cover.
11. Reinsert the tank.
12. Close the milling chamber door.



4.7 Replacing stepping motors



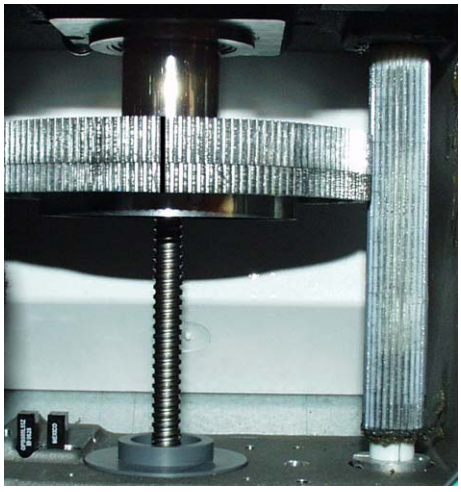
Overview of stepping motors

4.7.1 BR stepping motor

Preparations

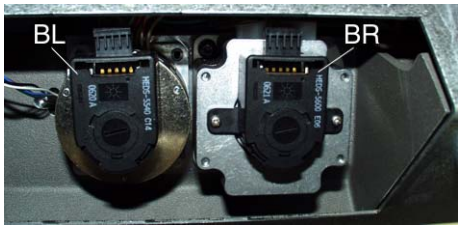
1. Remove all covers:
2. Unscrew the metal bracket (2 screws, TX 20 screwdriver).

Removing the stepping motor



CAUTION: Be sure to mark the gear wheels!
BEFORE unscrewing the stepping motor, clean the gear wheels and mark two aligned teeth of the clamping wheel and the gear wheel.

1. Pull off connectors **X5** and **X6**.



2. Pull the milling unit to the edge of the table and unscrew the 4 fastening screws on the **BR** stepping motor from below (TX10).
3. Pull out the stepping motor with the toothed roller downwards.

Installing the stepping motor

1. Turn the gear wheels so that the previously **marked teeth are aligned** and push the stepping motor with the toothed roller upward.
2. Screw the stepping motor tight with 4 screws.
3. Plug in connectors **X5** and **X6**.

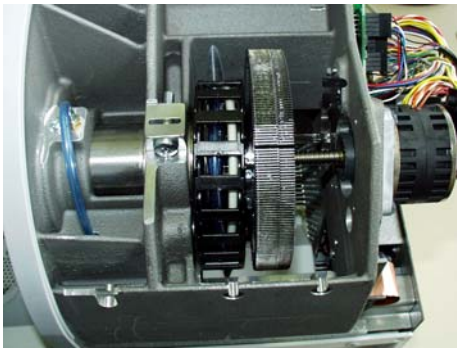
Final work

1. Screw the metal bracket back on again.
2. Reattach all covers.

4.7.2 GR / MR stepping motor

Preparations

1. Remove all covers except for the left/right cover, depending on which stepping motor is defective.
2. Loosen the 2 screws of the metal cover and lift it out (TX 20 screwdriver).



Removing the stepping motor

CAUTION: Be sure to mark the gear wheels!
BEFORE unscrewing the stepping motor, clean the gear wheels and mark two aligned teeth of the clamping wheel and the gear wheel.

1. Pull off connectors **X5** and **X6**.
2. Unscrew the 4 fastening screws from the stepping motor (TX 10).
3. Pull out the stepping motor with the toothed roller.

Installing the stepping motor

1. Turn the gear wheels so that the previously **marked teeth are aligned** and push the stepping motor with the toothed roller in.
2. Screw the stepping motor tight with 4 screws.
3. Plug in connectors **X5** and **X6**.

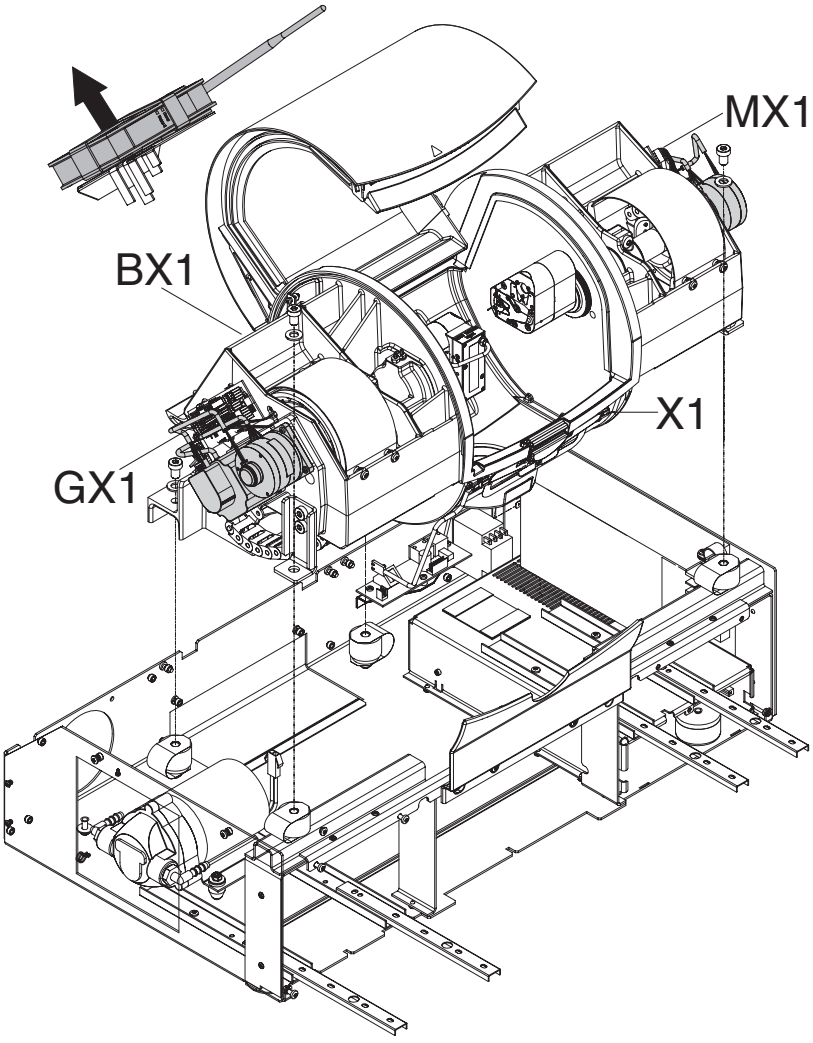
Final work

1. Reinsert the metal cover and screw it tight.
2. Reattach all covers.

4.8 Replacing the milling machine

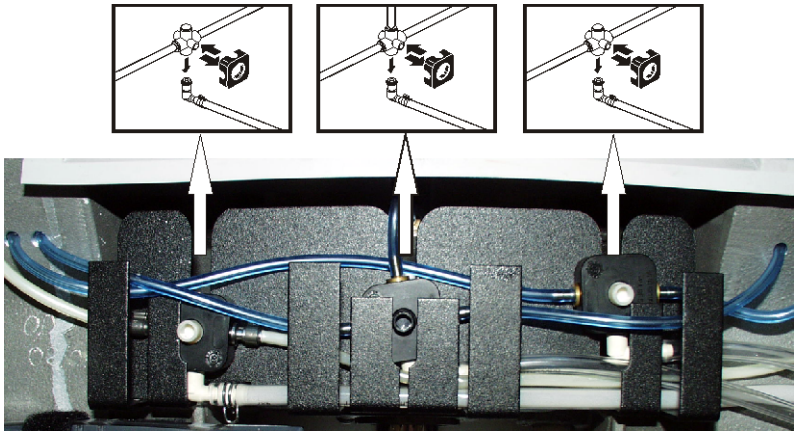
4.8.1 Removing the milling machine

1. Remove all covers:
2. Dismantle the DC motors (see chapter "Replacing the DC motors", Removal, Preparation and Removing the motor unit).
3. Pull off the radio module.



Milling machine

4. Pull connectors **GX1**, **BX1** and **MX1** off of the respective distribution board.
5. Disconnect reed contact connector **X5**.
6. Pull connector **X1** off of the milling chamber lighting.
7. Cut open the cable ties on the cable harness.
8. Take the cable harness out of the cable holder. At the same time, tilt the cable holder backwards slightly.



Pulling off the manifold

9. Pull the air and water manifolds out of the cable holder.

10. Pull off the nipple holder and pull out the offset (angled) nipple for each of the 3 manifolds. Then reattach the nipple holder to the manifold.

11. Unscrew the 4 fastening screws from the milling machine (with a 6 mm Allen key).

⚠CAUTION: Parts protruding inside
Be careful not to damage any parts that protrude inside.

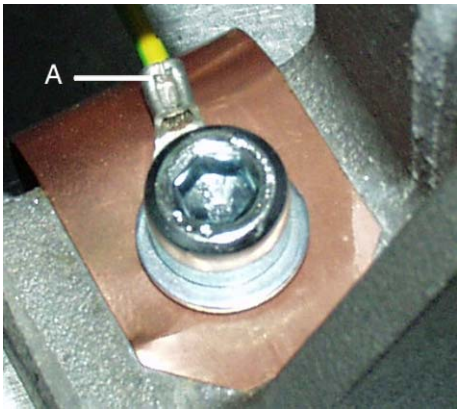
12. Carefully lift out the milling machine and put it down in a safe place.

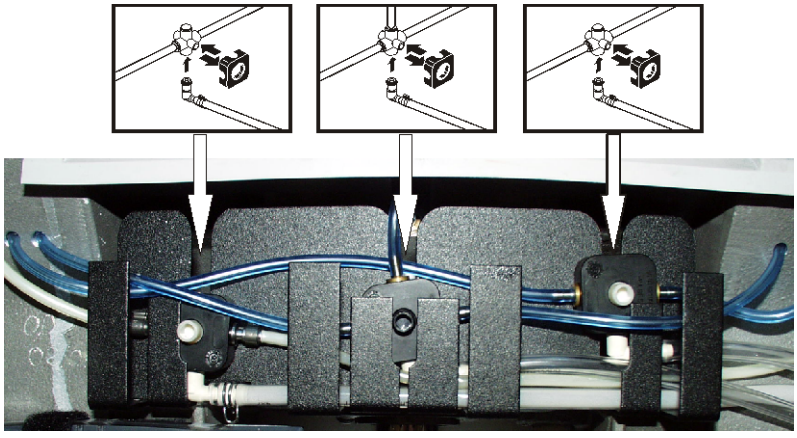
4.8.2 Installing the milling machine

⚠CAUTION: Parts protruding inside
Be careful not to damage any parts that protrude inside.

1. Insert the milling machine carefully.

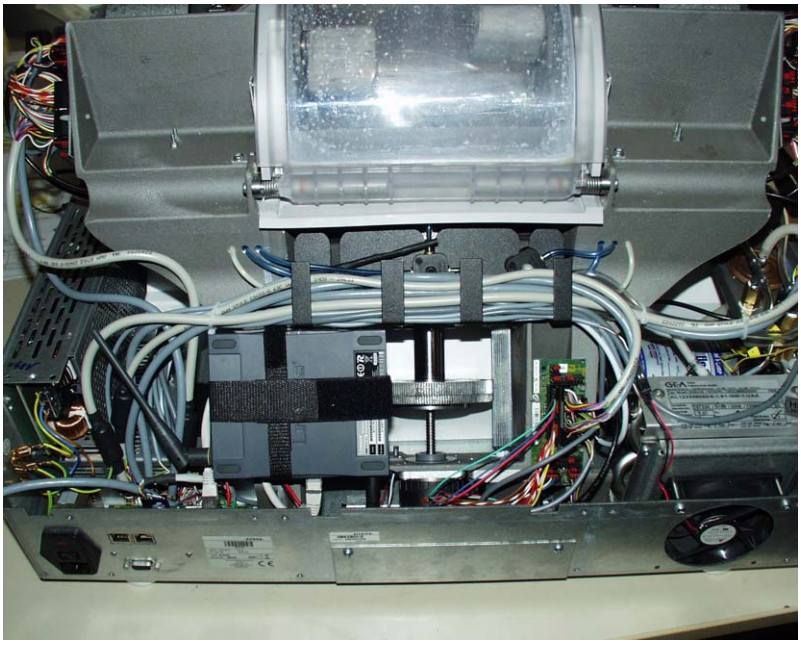
2. Bend the copper band on each foot over and screw the milling machine down tight using 4 screws and washers. Also screw ground conductor **A** tight at the rear right.





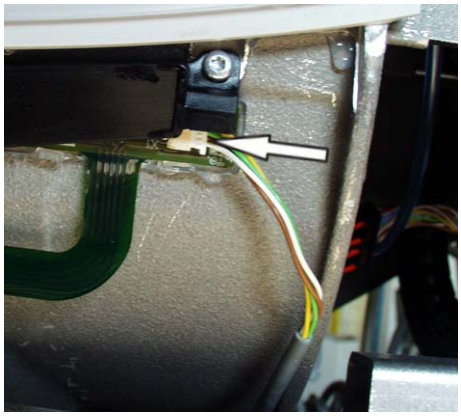
Inserting the manifolds

3. Pull off the nipple holder from each of the 3 manifolds and insert the offset nipple with the same color in each of the hoses. Then reattach the nipple holder to the manifold.
4. Insert the 3 manifolds in their respective guides on the cable holder.



Inserting the cable harness

5. Place the cable harness in the cable holder.
6. Plug connector **X1** into the milling chamber lighting.
7. Connect reed contact connector **X5**.
8. Plug connectors **GX1**, **BX1** and **MX1** into the respective distribution board.
9. Plug in the radio module.
10. Fasten the cables with cable ties.
11. Install the DC motors (see chapter "Replacing the DC motors", Installation, Installing the motor unit).



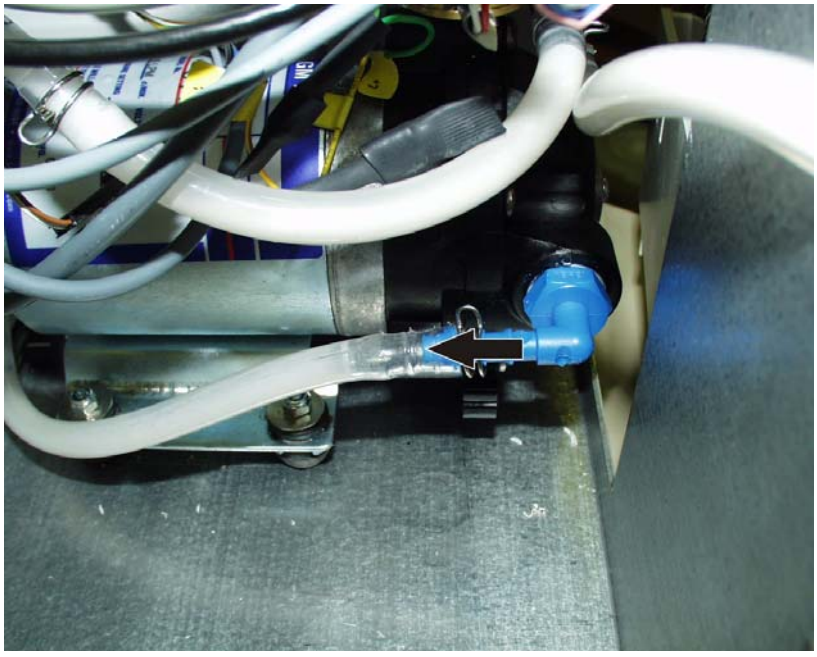
4.9 Replacing the tank switch

4.9.1 Preparations

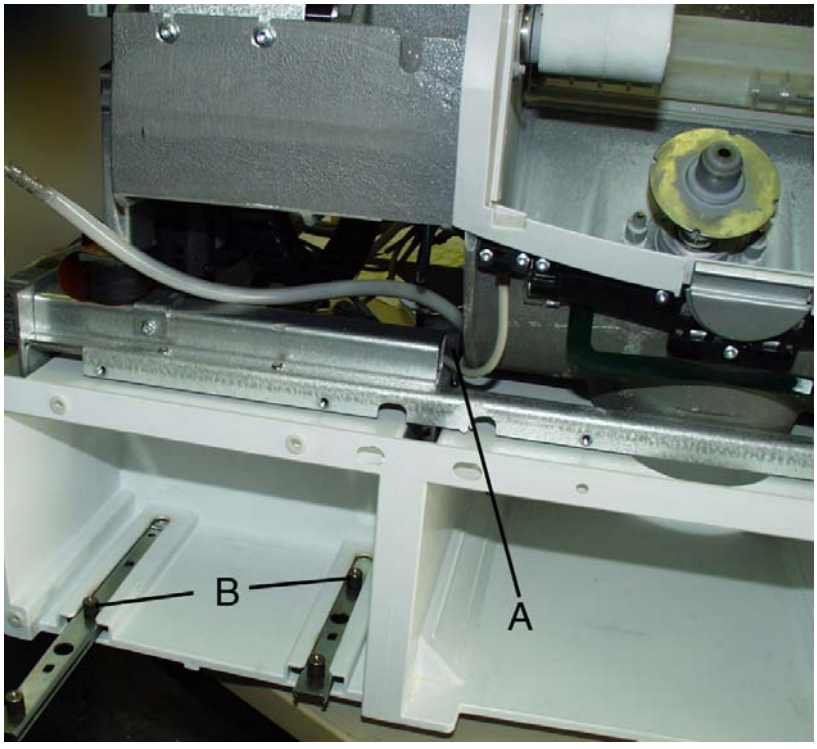
1. Remove all covers:
2. Pull out the tank.
3. Pull out the drawer on the left and on the right.
4. Unscrew both drawers (4 screws each, using a TX 9 screwdriver).

4.9.2 Removing the chassis insert

1. Unscrew the 4 screws on the rear side of the cooling pack (TX 20 screwdriver).
2. Take out the fan unit and the cooling pack.

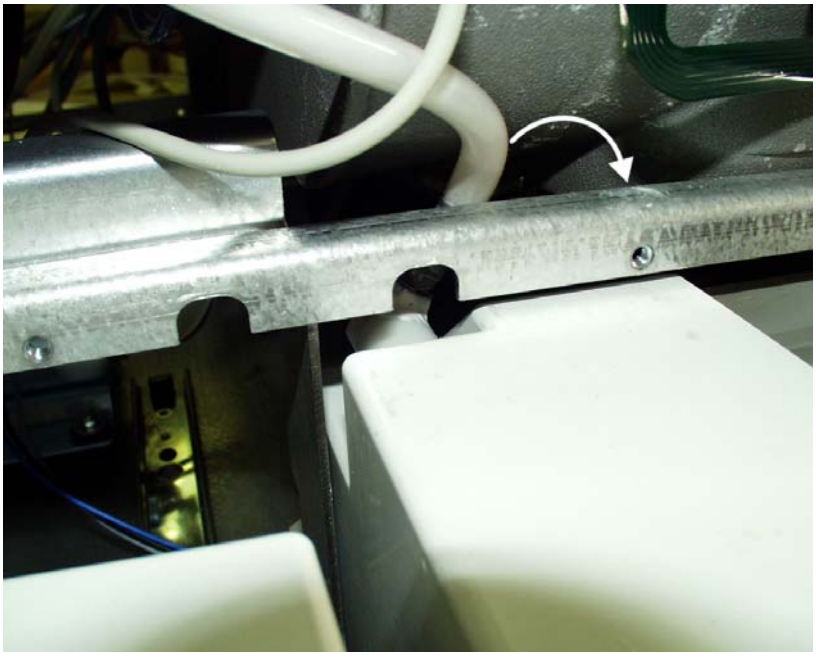


3. Open the hose clip at the suction end of the water pump and pull the hose off.



Taking out the chassis insert

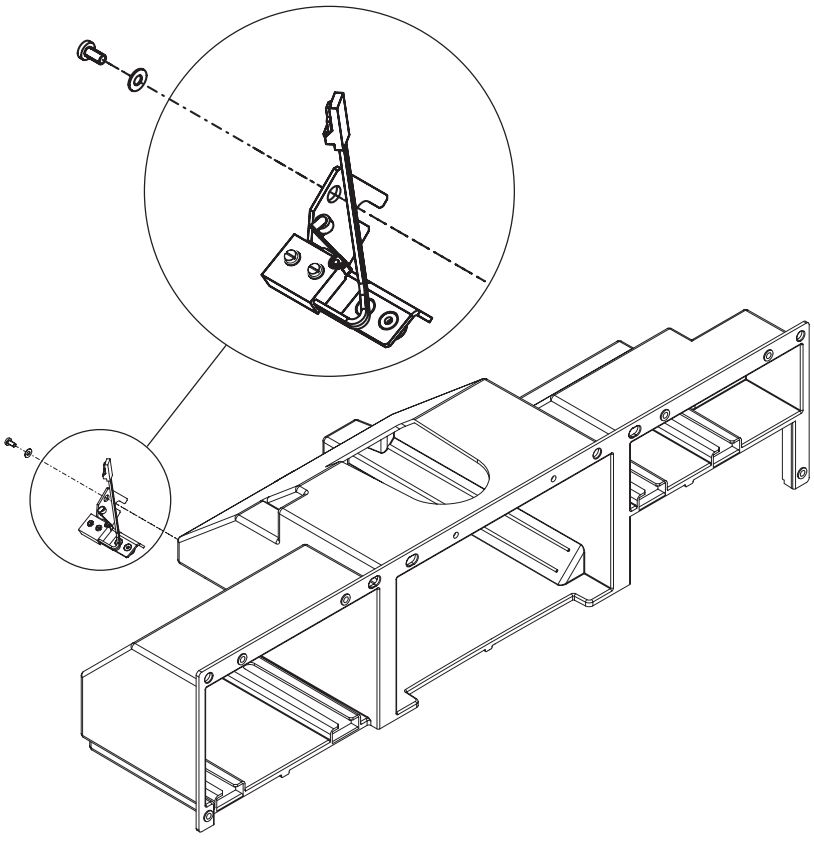
4. Insert the hose toward the front and carefully pull the chassis insert forward until you can see the suction connection in space **A**.



Rotating the suction connection

5. Place the door switch solenoid cable to one side and rotate the suction connection clockwise until the hose with the suction connection can be pulled out underneath the metal bracket.
6. Unscrew the rear rubber-metal mountings **(B)** and slide the rails toward the rear (TX 10 screwdriver).
7. Disconnect the plug connection of the tank switch and carefully pull out the chassis insert.

4.9.3 Replacing the tank switch

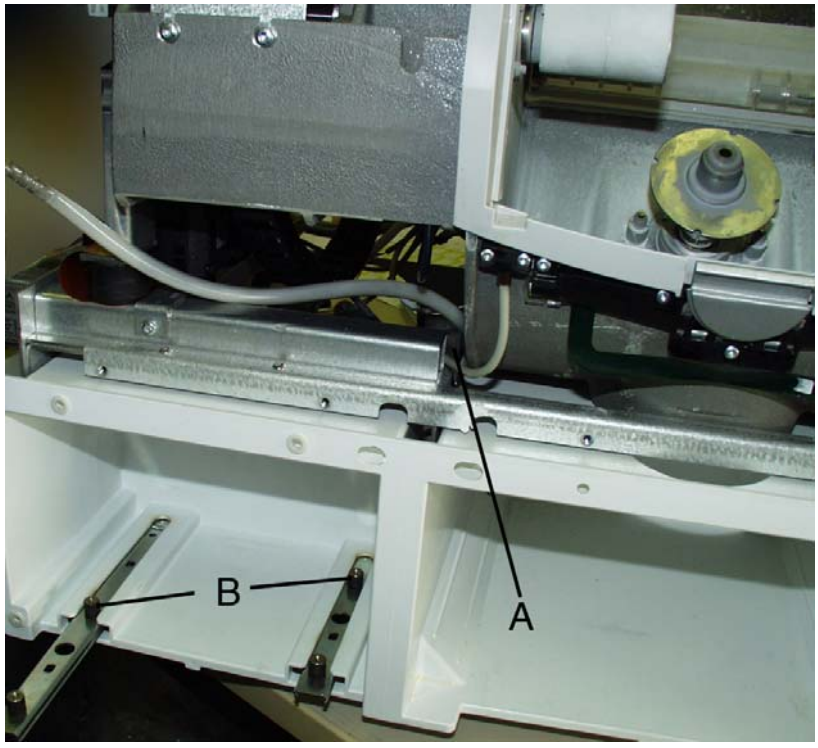


Replacing the tank switch

1. Unscrew the defective tank switch
2. Screw on the new tank switch.

4.9.4 Installing the chassis insert

1. Insert the chassis insert carefully.
2. Insert the rails toward the front and screw on the rear rubber-metal mountings **B**.



Taking out the chassis insert

3. Push through the hose with the suction connection underneath the metal bracket and rotate the suction connection counterclockwise until the suction connection with hose can be laid to the rear in space **A**. Then run the door switch solenoid cable back into space **A**.
4. Reconnect the plug connection of the tank switch.
5. Plug the hose into the suction end of the water pump and fasten it with the hose clip.
6. Insert the cooling pack.
7. Insert the fan unit so that the embossed arrows on the fan point upward and to the rear.
8. Screw on the fan unit with the 4 screws.

4.9.5 Final work

1. Screw on both drawers (4 screws each, using a TX 9 screwdriver).
2. Pull out the drawer on the left and on the right.
3. Reinsert the tank.
4. Reattach all covers.

4.10 Replacing the suction connection

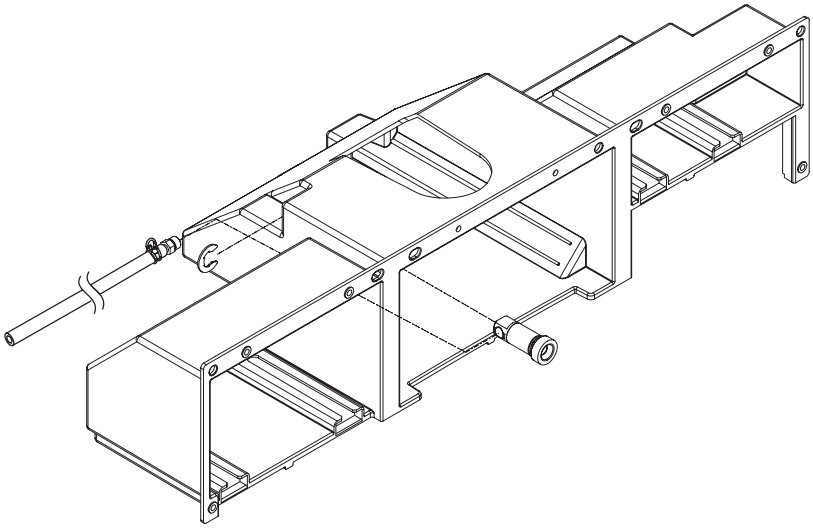
4.10.1 Preparations

1. Remove all covers:
2. Pull out the tank.
3. Pull out the drawer on the left and on the right.
4. Unscrew both drawers (4 screws each, using a TX 9 screwdriver).

4.10.2 Removing the chassis insert

The removal of the chassis insert is described in the preceding chapter "Replacing the tank switch", see "Removing the chassis insert" [🗎 98].

4.10.3 Replacing the suction connection



Replacing the suction connection

1. Unscrew the hose nipple with the hose (open-end wrench, 10 mm A/F).
2. Remove the shaft lock-down device and pull out the suction connection toward the front.
3. Insert the new suction connection and fasten it with the shaft lock-down device.
4. Seal the thread with teflon tape and screw the suction connection tight again.

4.10.4 Installing the chassis insert

The installation of the chassis insert is described in the preceding chapter "Replacing the tank switch", see "Installing the chassis insert" [🗎 100].

4.10.5 Final work

1. Screw on both drawers (4 screws each, using a TX 9 screwdriver).
2. Pull out the drawer on the left and on the right.
3. Reinsert the tank.
4. Reattach all covers.

4.11 Replacing the light barrier

Light barrier, B axis

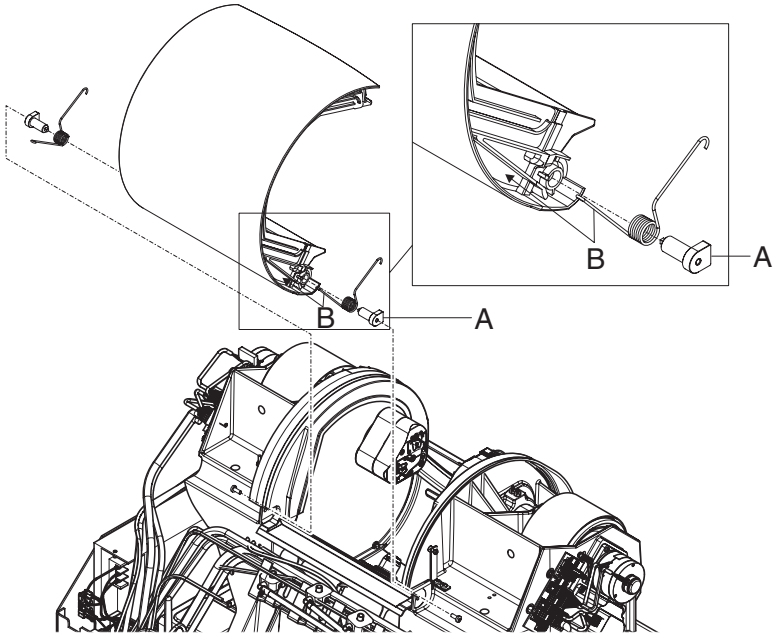
1. Remove the rear panel cover and the intermediate cover.
2. Unscrew the metal bracket (2 screws, TX 20 screwdriver).
3. Disconnect light barrier connector **X10**.

4. Pull the milling unit to the edge of the table and unscrew the defective light barrier from below (TX 10).
5. Screw on the new light barrier.
6. Connect connector **X10**.
7. Screw the metal bracket back on again.
8. Reattach all covers.

G-axis and M-axis light barriers

1. Use the service software to determine which light barrier is defective.
2. Remove all covers except for the left/right cover, depending on which light barrier is defective.
3. Disconnect light barrier connector **X10**.
4. Unscrew the defective light barrier (TX 10).
5. Screw on the new light barrier.
6. Connect connector **X10**.
7. Reattach all covers.

4.12 Replacing the milling chamber door



Replacing the milling chamber door

1. Remove all covers:
2. Open the milling chamber door.
3. Unscrew the two fastening screws of the milling chamber door.
4. Carefully pull out the milling chamber door.
5. Place the new springs on holder **A** and in guide **B** of the milling chamber door on both sides as shown.
6. Insert the milling chamber door so that the flattened side of holder **A** faces toward the front and fits snugly on the cast part. Use the two fastening screws to screw on the milling chamber door securely.

7. Close the milling chamber door.
8. Check to make that the milling chamber door engages and automatically opens when the catch is pressed.
9. Reattach all covers.

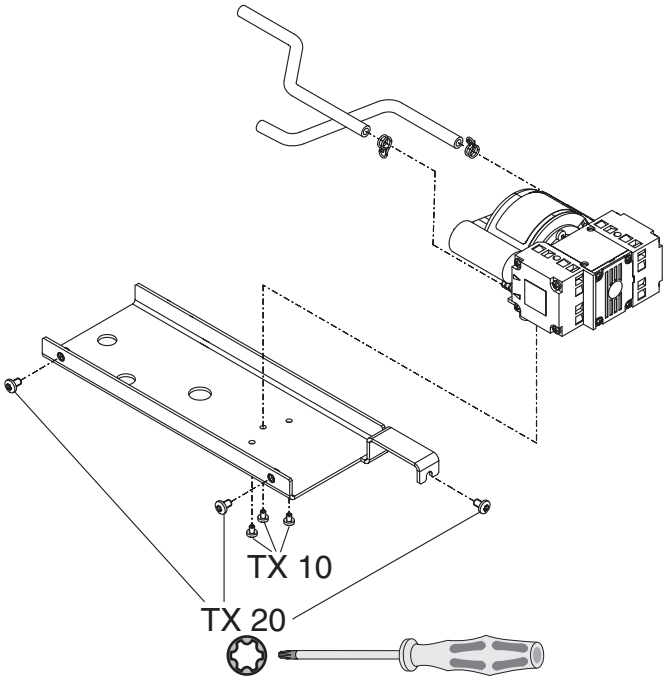
4.13 Replacing the air pump

Preparations

1. Remove all covers except for the right cover.
2. Unscrew the fan unit and take it out of the cooling pack.
3. Cut open the cable tie on the cable harness.

NOTE:
To obtain more space, you can pull off connector **GX1**.

Removal



Replacing the air pump

1. Unscrew the air pump mount (3 screws, TX20).
2. Unscrew the air pump from the mount (3 screws, TX10).
3. Disconnect power supply connector **X6**.
4. Remove the 2 hose clips and pull off the hoses.

Installation

1. Slide both hoses onto the new air pump and secure them with the two hose clips.
2. Screw the air pump onto the mount with 3 screws.
3. Screw on the air pump mount with 3 screws.
4. Connect power supply connector **X6**.

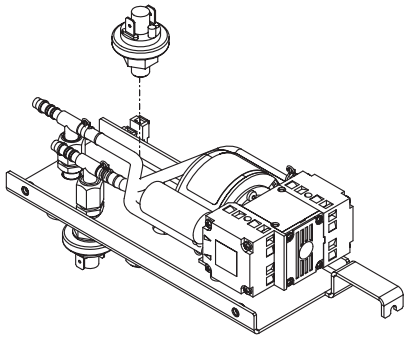
Final work

1. If necessary, plug connector **GX1** back in and refasten the cables with a cable tie.
2. Screw the fan unit and the cooling pack back on.
3. Reattach all covers.

4.14 Replacing the pressure switch

4.14.1 Water pressure switch

1. Remove all covers except for the right cover.

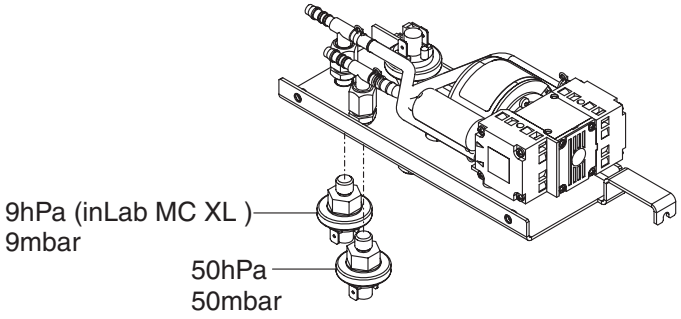


Water pressure switch

2. Pull the connector off of the pressure switch.
3. Unscrew the pressure switch.
4. Seal the thread of the new pressure switch with teflon tape and screw it tight.
5. Plug the connectors into the new pressure switch.
6. Reattach all covers.

4.14.2 Air pressure switch

1. Remove all covers except for the right cover.



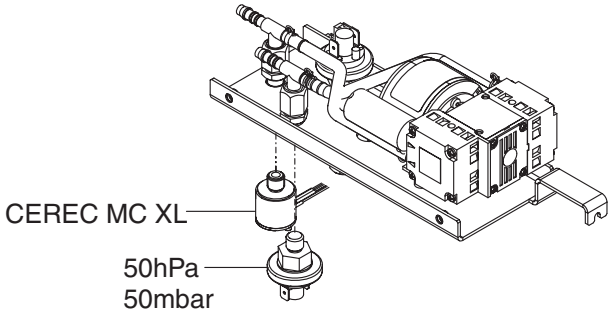
Air pressure switch

2. Pull the connector off of the pressure switch.
3. Unscrew the pressure switch.
4. Seal the thread of the new pressure switch with teflon tape and screw it tight.
5. Plug the connectors into the new pressure switch.

6. Reattach all covers.

4.14.3 Air pressure sensor (CEREC MC XL only)

1. Remove all covers except for the right cover.

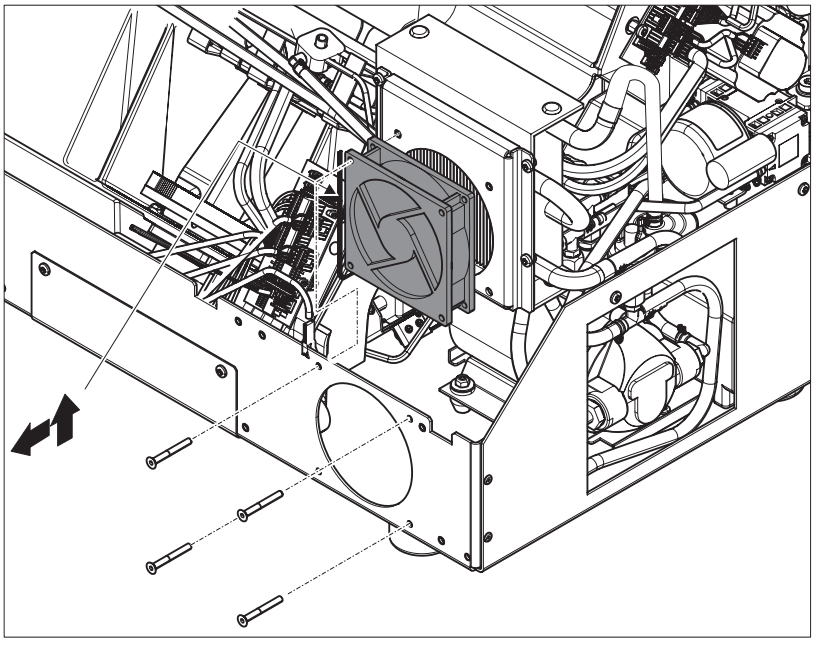


Air pressure sensor

2. Disconnect connector **X19**.
3. Unscrew the pressure sensor.
4. Seal the thread of the new pressure sensor with teflon tape and screw it tight.
5. Connect connector **X19**.
6. Reattach all covers.

4.15 Replacing the fan unit

1. Remove all covers except for the right cover.



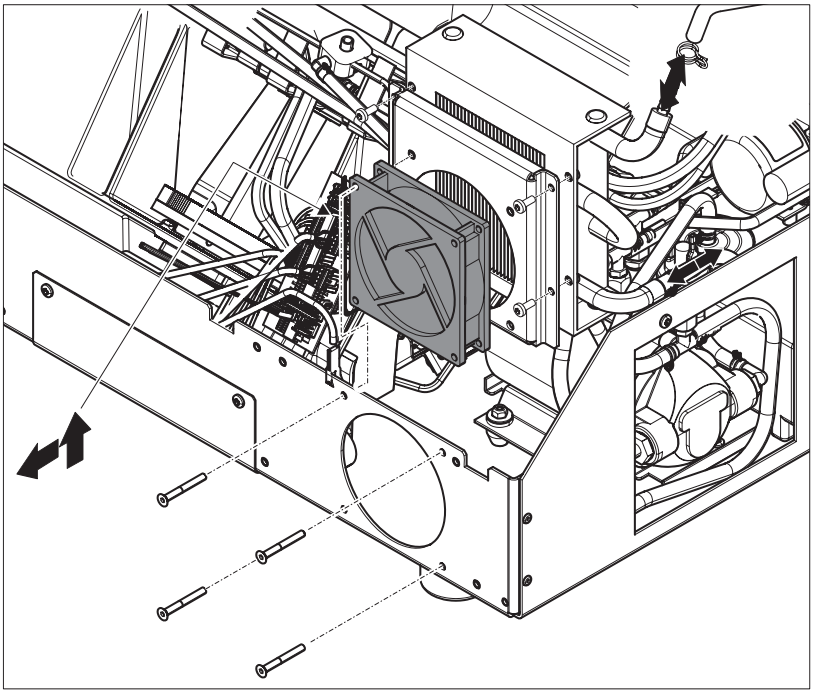
Replacing the cooling unit

2. Unscrew the 4 screws on the rear side of the cooling pack (TX 20 screwdriver).
3. Take out the fan unit and disconnect connector **X8**.

4. Connect connector **X8** of the new fan unit.
5. Insert the fan unit so that the embossed arrows on the fan point upward and to the rear.
6. Screw on the fan unit with the 4 screws.
7. Reattach all covers.

4.16 Replacing the cooling pack

1. Remove all covers except for the right cover.

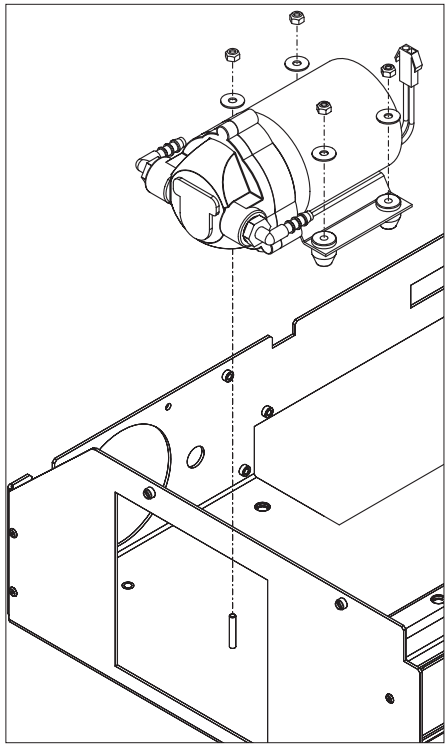


Replacing the cooling pack

2. Unscrew the 4 screws on the rear side of the cooling pack (TX 20 screwdriver).
3. Take out the fan unit.
4. Unscrew the cooler holder by removing the 4 screws from the cooling pack (TX 20 screwdriver).
5. Open the 2 hose clips and pull off both hoses.
6. Slide both hoses onto the new cooling pack and secure them with the hose clips.
7. Screw the cooler holder onto the cooling pack with the 4 screws.
8. Insert the fan unit so that the embossed arrows on the fan point upward and to the rear.
9. Screw on the fan unit with the 4 screws.
10. Reattach all covers.

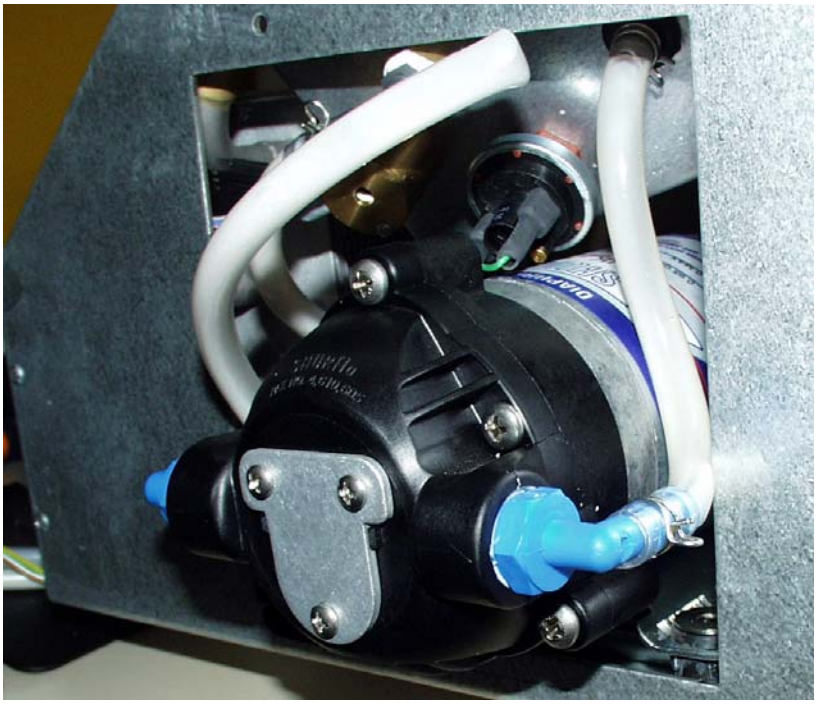
4.17 Replacing the water pump

1. Remove the milling machine as described in the chapter "Removing the milling machine".
2. Disconnect power supply connector **X10**.
3. Unscrew the air pump mount (3 screws, TX20).



Water pump

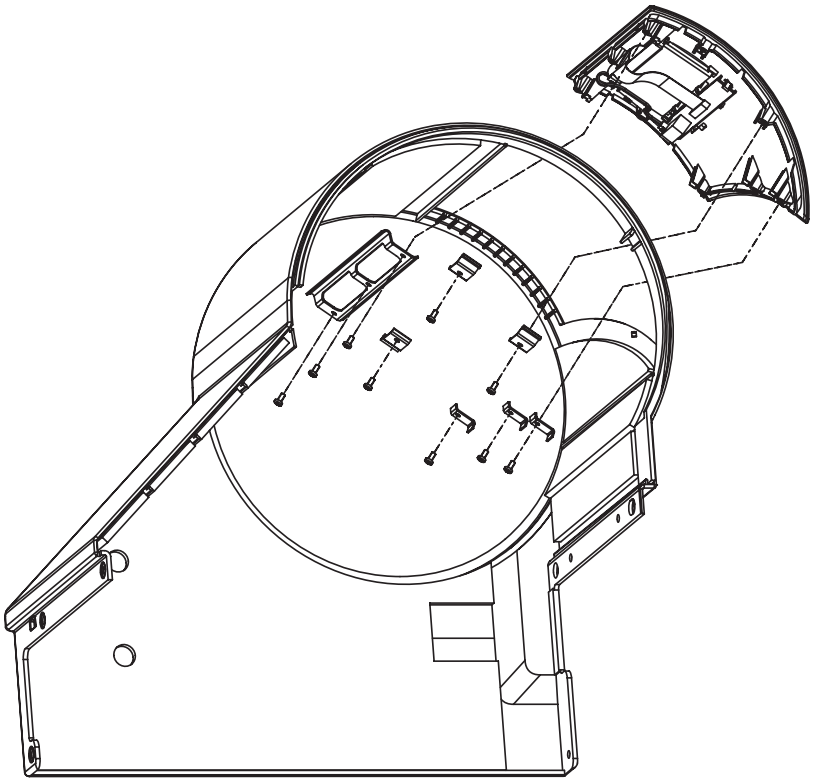
4. Unscrew the water pump (4 screws, 7 mm torque wrench).
5. Pull the water pump out through the side opening just far enough so that the hose clips are accessible.



Water pump in opening

6. Remove the 2 hose clips and pull off the hoses.
7. Remove the water pump through the side opening and insert the new one.
8. Slide on both hoses and secure them with the two hose clips.
9. Screw on the water pump with 4 screws.
10. Screw on the air pump mount with 3 screws.
11. Connect power supply connector **X10**.
12. Reinstall the milling machine as described in the chapter "Installing the milling machine".

4.18 Replacing the display



Replacing the display

1. Remove all covers except for the left cover.
2. Pull off connector **X15**.
3. Unscrew the defective display.

NOTE: Display is deforming
If you tighten the screws too tightly on one side, the display deforms.

➢ Turn the screws carefully in a diagonal sequence.

4. Screw on the new display.
5. Plug in connector **X15**.
6. Reattach all covers.

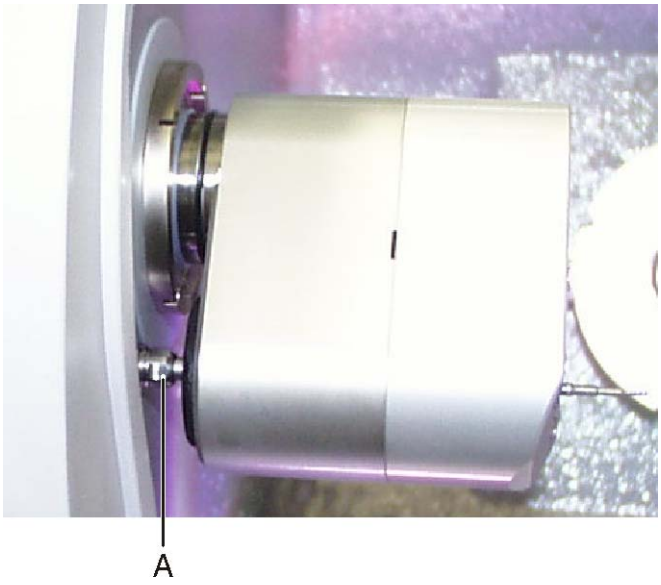
4.19 Adjusting the plunger pin

4.19.1 G-axis and M-axis plunger pin

1. Switch the milling unit and the PC on.
2. Start the service software and start the test step `"Light barriers, door switch, temperatur sensor, motor stop position"`.
3. Select the `"Adjustment"` option button.
4. Click the `"Adjustment"` button.

↳ The motors move to the adjustment position of the plunger pin.

5. Open the milling chamber door.



Plunger pin

6. Turn the DC motor manually in such a way that the plunger pin does **not** contact the center but instead the external areas of the snap-on lid.
7. Unscrew plunger pin **A** with an open-end wrench (6 mm wide) so that there is contact between the locking knob and the snap-on lid.Turn the DC motor by hand and check if it slips with light pressure by the locking knob.

4.19.2 B-axis plunger pin

Checking the plunger pin

1. Switch the milling unit and the PC on.
2. Open the milling chamber door.
3. Insert the calibration phantom with calibration protection.
4. Start the service software and start the test step `"Light barriers, door switch, temperatur sensor, motor stop position"`.
5. Select the `"Adjustment"` option button.
6. Click the `"Block closed"` button.
7. Click the `"Adjustment"` button.
8. Open the milling chamber door.

Measuring the distance

9. Measure the distance between the plunger pin and the block clamping nut using a 0.1 mm feeler gage. This distance must not exceed 0.1 mm. Only a slight touching noise should be audible when the block clamping nut is running. At the same time, the block clamping nut must not engage.

Adjusting the plunger pin

✓ If the distance between the plunger pin and the block clamping not is not 0.1 mm, you must adjust the plunger pin.

1. Click the "Block open" button.
2. Take out the calibration phantom.
3. Unscrew the block clamping nut.
4. Adjust the plunger pin with a socket wrench (6mm A/F).
5. Insert the calibration phantom with calibration protection.
6. Screw open the block clamping nut.
7. Click the "Block closed" button.
8. Click the "Adjustment" button.
9. Measure the distance between the plunger pin and the block clamping nut using a 0.1 mm feeler gage. This distance must not exceed 0.1 mm. Only a slight touching noise should be audible when the block clamping nut is running. At the same time, the block clamping nut must not engage.
10. Repeat these steps until the distance between the plunger pin and the block clamping nut does not exceed 0.1 mm.

⚠CAUTION: Plunger pin blocking hazard
Make sure that the moving parts of the plunger pin do not come into contact with Loctite.
Loctite 221 may only be applied to the thread.

11. Once you have adjusted the plunger pin, apply one drop of Loctite 221 to the thread.

4.20 Replacing the block fastener

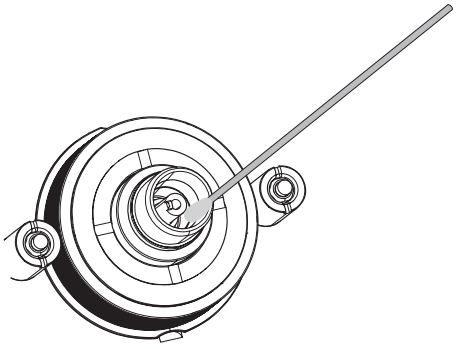
Removing the block fastener

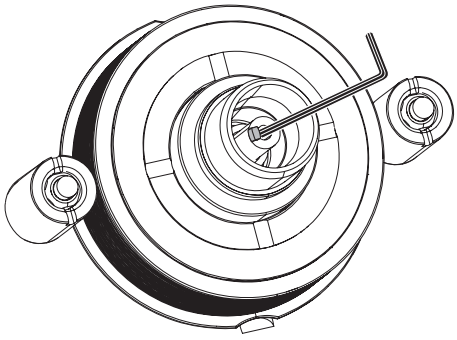
✓ The milling unit is in the "Home" position

✓ The block fastener pin is in 9 o'clock position

⚠CAUTION: Do not twist the block axle!
The pin of the new block fastener must also be in 9 o'clock position after installation.
When screwing the block clamping nut in and out make sure that the block axle is not twisted.

1. Unscrew the block clamping nut to be replaced counterclockwise and remove it.
2. Remove dirt and any possible water residue from inside the block axle e.g. with a swab from the cleaning set.

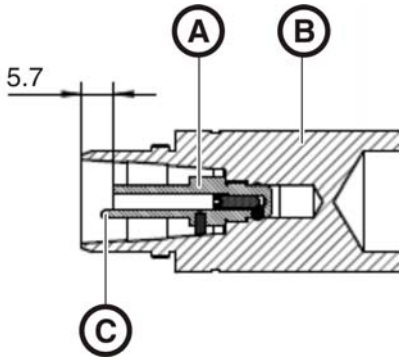




3. Loosen the block fastener with an Allen screw (1.3 mm) counterclockwise (approx. 3 rotations).
4. Pull out the block fastener using the flat pliers.

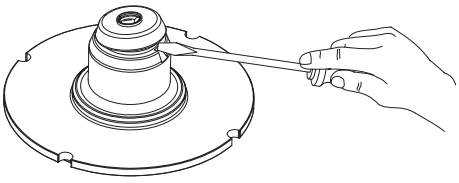
Installing the block fastener

1. Insert the block fastener as far as it will go and tighten it.
2. Check if the pin of the block fastener is in 9 o'clock position.

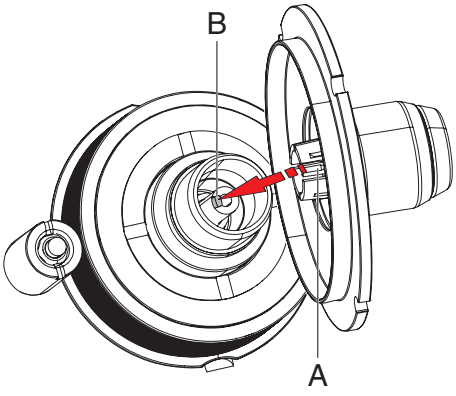


A	Block fastener
B	Block axle
C	Pin of block fastener

3. Ensure that the block fastener is installed properly using the flat pliers to check whether it can be pulled out. The distance between block fastener and the outer edge of the block axle must be 5.7 mm.
4. Clean and grease the block chuck and block clamping nut as described under Clean chucks [🗎 116].
5. Lift the chuck gasket with a screwdriver and insert the new chuck gasket supplied with the unit. If there is a D10 block clamping nut replace the chuck gasket there as well.



Installing the block clamping nut



1. Place the block clamping nut on the block axle so that the opening in chuck **A** lines up with the pins of block fastener **B**.
2. Turn the block clamping nut clockwise (approx. 3 rotations).

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The Dental Company

Cleaning the chucks

CEREC / inLab MC XL

5 Cleaning the chucks

Contents

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5.1 Block chuck and block clamping nut

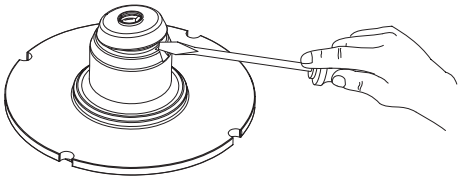
NOTE:
For CEREC MC XL: every 3 months
For inLab MC XL: after approx. 50 milled restorations or every 2 weeks
clean and**lubricate** the block chuck and block clamping nut.

Removing the block clamping nut

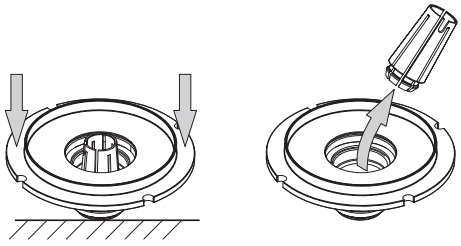
WARNING: Risk of injury on milling instruments (burs)
Be careful not to brush against the milling instruments with your hand.

1. Press the catch of the milling chamber door and open the door.
2. Unscrew the block clamping nut to be replaced counterclockwise and remove it.

Removing the chuck

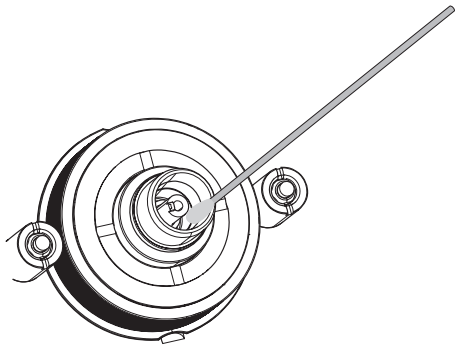


1. Use a screwdriver to pry out the chuck gasket.

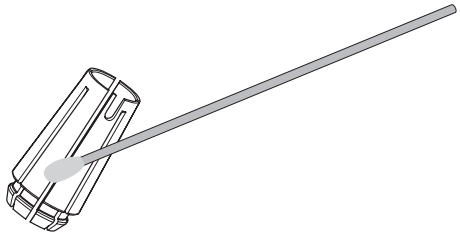


2. Place the block clamping nut on a rigid support as shown and push the chuck out.

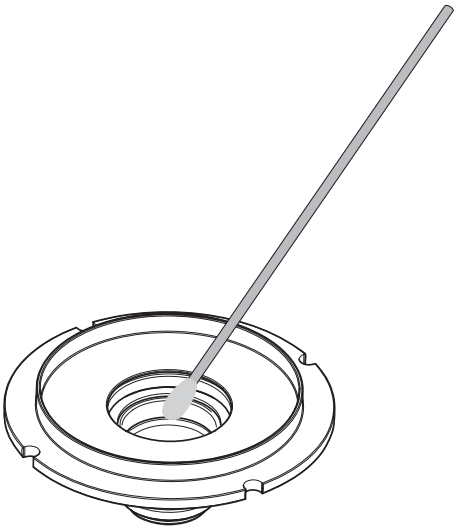
Cleaning and greasing



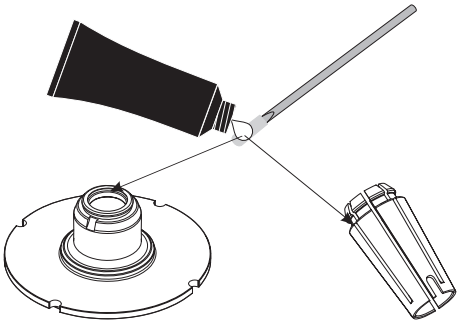
1. Clean the inside of the block axle with a cotton swab and undiluted ethanol (commercially available cleaning alcohol).



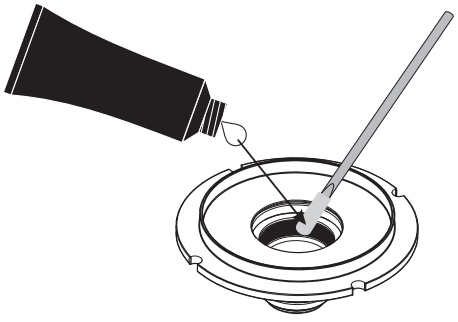
2. Clean the inside of the chuck with a cotton swab and undiluted ethanol (commercially available cleaning alcohol).



3. Clean the inside of the blocking clamp nut with a cotton swab and undiluted ethanol (commercially available cleaning alcohol).

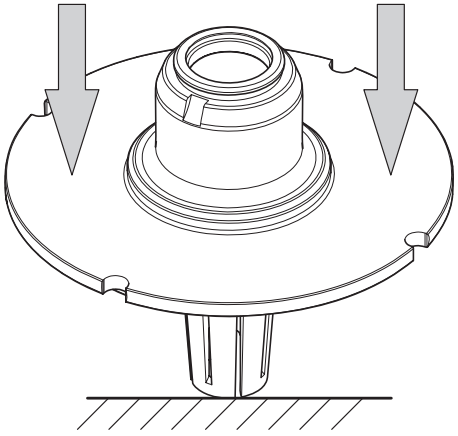


4. Grease the stop edge of the chuck and the block clamping nut lightly with the supplied grease. Do this using the rounded-off cotton swabs supplied for this purpose.

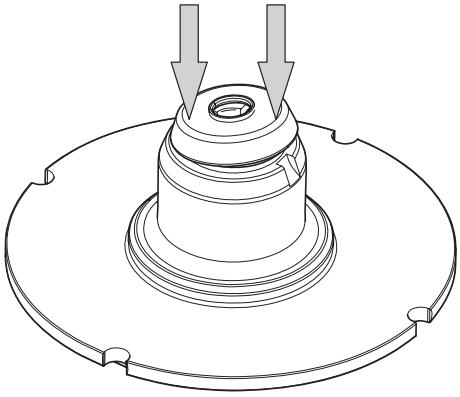


5. Grease the thread of the block clamping nut lightly.

Installing the chuck

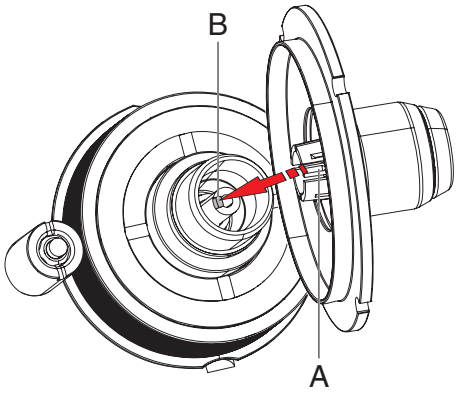


1. Place the chuck on a rigid support as shown and push the block clamping nut on top of it until it locks in place.



2. Push the chuck gasket onto the chuck.

Installing the block clamping nut



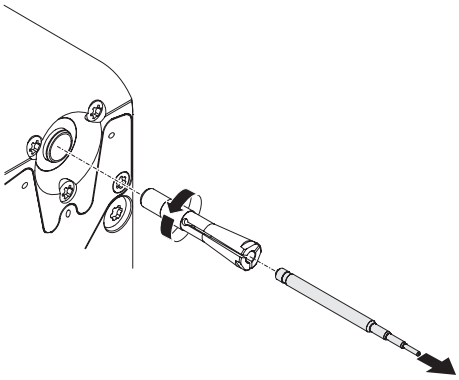
1. Place the block clamping nut on the block axle so that the opening in chuck **A** lines up with the pins of block fastener **B**.
2. Turn the block clamping nut clockwise (approx. 3 rotations).

5.2 Milling instrument chucks

NOTE: Once a year
Clean the chucks of the milling instruments and grease the threads.

✓ The motors are in the position for changing the milling instruments (burs).

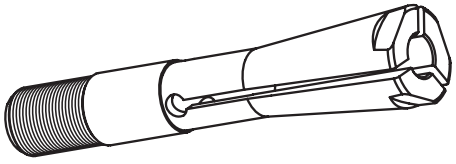
1. Unscrew the chuck and remove the milling instrument.



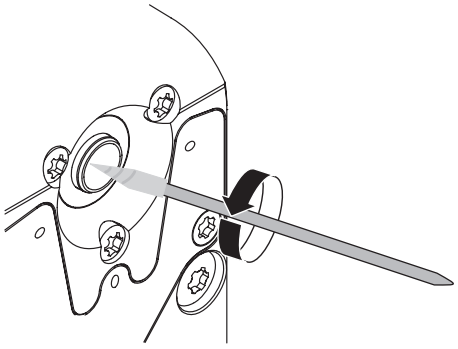
2. Clean the inside and outside of the chuck with a supplied pointed cotton swab and undiluted ethanol (commercially available cleaning alcohol). When doing this, rotate the cotton swab counterclockwise in order to push the dirt out.

3. Clean the thread with a clean cloth and undiluted ethanol (commercially available cleaning alcohol).

4. Grease the thread very lightly.

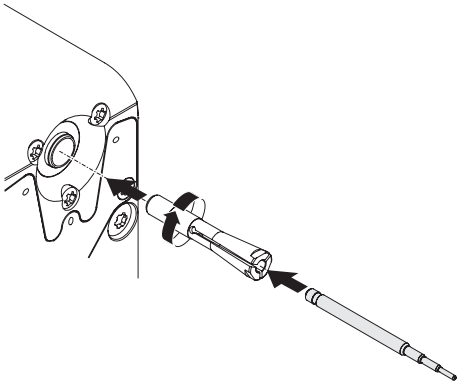


5. Clean the inside of the clamping cone with a pointed cotton swab and undiluted ethanol (commercially available cleaning alcohol). When doing this, rotate the cotton swab counterclockwise in order to push the dirt out.



6. Insert the milling instrument in the chuck and screw in the chuck by hand. Screw the milling instrument tight with the torque wrench.

7. Repeat these steps until you have cleaned all of the milling instrument chucks.



We reserve the right to make any alterations which may be required due to technical improvements.

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